SPAWAR
Systems Center
San Diego

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May 2001

SSC San Diego Command History Calendar Year 2000

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SSC San Diego
San Diego, CA 92152-5001

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Commanding Officer

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Executive Director

ADMINISTRATIVE INFORMATION

This technical document was prepared in response to OPNAVINST 5720.12F. The document summarizes the major activities and achievements of Space and Naval Warfare Systems Center, San Diego (SSC San Diego) in 2000. This document was prepared by the Technical Information Division using in-house funding.

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LH

Preface

The Space and Naval Warfare Systems Center, San Diego (SSC San Diego) Command History for calendar year (CY) 2000 is submitted in conformance with OPNAVINST 5750.12F. The history provides a permanent record of CY 2000 activities at SSC San Diego. Although the history covers one calendar year, much of the information was only available on a fiscal year (FY) basis and is so noted in the text.

Organization of Document

The history is divided into three main sections. The first section is a general introduction to SSC San Diego. The second section describes administrative developments. The third section documents technical highlights in 2000.

To conform to OPNAVINST 5750.12F guidelines and to facilitate review and approval of the information, technical accomplishments are grouped by SSC San Diego major departments. Readers familiar with the SSC San Diego organizational structure can access information by consulting the department section of interest. Cross-references are given in the text when possible to find related or expanded discussions.

C^4ISR Programs. As discussed in the introductory section, SSC San Diego technical programs focus largely on C^4ISR, corresponding roughly to the Center's organizational structure (e.g., most command and control programs are included in section for the Command and Control Department).

Interdepartmental Programs. Many programs are interdepartmental efforts. Interdepartmental program efforts are included in the department section corresponding to the major responsible code. For example, SSC San Diego's participation in Fleet Battle Experiment-Foxtrot (FBE-F) was an interdepartmental effort. The team was led by the Command and Control Department; therefore the discussion is found in the Command and Control section.

Complementary Programs. Programs and research outside of the C^4ISR focus (see the discussion in the general introduction to SSC San Diego) are also included in the major department sections.

A Note on Programs

Because the results of scientific work often develop out of many years' effort, programs are not always documented annually. Previous command histories provide extensive background articles on many major programs. When possible, background articles are prepared for new or previously untreated programs. By consulting command histories written over a period of several

years, a reader can follow the broad thrusts of SSC San Diego's research and development.

Sources

Numerous sources were used to prepare this history. Retrievable sources are included in section References/Notes. General points of contact are given when possible; further points of contacts may be found in the referenced sources or by contacting the SSC San Diego Public Affairs Office.

Appendices

Appendices to this document provide supplementary SSC San Diego information. Appendix A lists achievement awards given in CY 2000. Appendix B lists patents awarded in CY 2000. Appendices C and D provide lists of distinguished visitors hosted by SSC San Diego and major conferences and meetings at SSC San Diego, respectively.

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Introduction

Introduction to SSC San Diego

The Space and Naval Warfare Systems Center, San Diego (SSC San Diego)* is a full-spectrum research, development, test and evaluation (RDT&E), engineering and fleet support center serving the Navy, Marine Corps, and other Department of Defense (DoD) and national sponsors within its mission, leadership assignments, and prescribed functions. SSC San Diego reports directly to the Commander, Space and Naval Warfare Systems Command (SPAWAR).

Mission

SSC San Diego's formal mission is "To be the Navy's full-spectrum research, development, test and evaluation, engineering and fleet support center for command, control and communication systems and ocean surveillance and the integration of those systems which overarch multiplatforms."

Leadership and Technology Areas

Consistent with our mission, eight leadership areas are formally assigned to SSC San Diego. These leadership areas clearly represent SSC San Diego's command, control, communication, computers, intelligence, surveillance, and reconnaissance (C^4ISR) charter as well as leadership areas outside that scope—ocean engineering and marine mammals. Beyond these, SSC San Diego has demonstrated national- and international-level expertise in a broad range of technology areas.

Assigned Leadership Areas

- Command, control, and communication (C^3) systems
- Command, control, and communication systems countermeasures
- Ocean surveillance systems
- Command, control, and communication modeling and analysis
- Ocean engineering
- Navigation systems and techniques
- Marine mammals
- Integration of space communication and surveillance systems

Technology Areas

- Ocean and littoral surveillance
- Microelectronics
- Communications and networking
- Topside design/antennas

* Note: SSC San Diego is also referred to as "the Center" throughout this document.

- Command systems
- Computer technology
- Navigation and aircraft C3
- Intelligence/surveillance/reconnaissance sensors
- Atmospheric effects assessment
- Marine mammals
- Environmental quality technology/assessment

Vision

SSC San Diego's vision is: "To be the nation's pre-eminent provider of integrated C^4ISR solutions for warrior information dominance." SSC San Diego's vision guides the Center's efforts in defining, developing, integrating, installing, and sustaining C^4ISR systems.

Programs

SSC San Diego conducts a broad range of programs that focus on integrated C^4ISR. The Center also conducts several unique programs outside of our primary C^4ISR focus: Environmental Quality Technology/Assessment, Marine Resources, Marine Mammals, Ocean Engineering, and Robotics and Physical Security. Innovative new research is encouraged through our In-House Laboratory Independent Research (ILIR) Program.

Organization

SSC San Diego's major staff and technical departments include Science, Technology, and Engineering; Navigation and Applied Sciences; Command and Control; Fleet Engineering; Intelligence, Surveillance, and Reconnaissance; Communication and Information Systems; and SPAWAR Systems Activity, Pacific. Major organizational changes in 1999 are described in Administrative Developments. Figure 1 shows SSC San Diego's organization as of 31 December 2000.

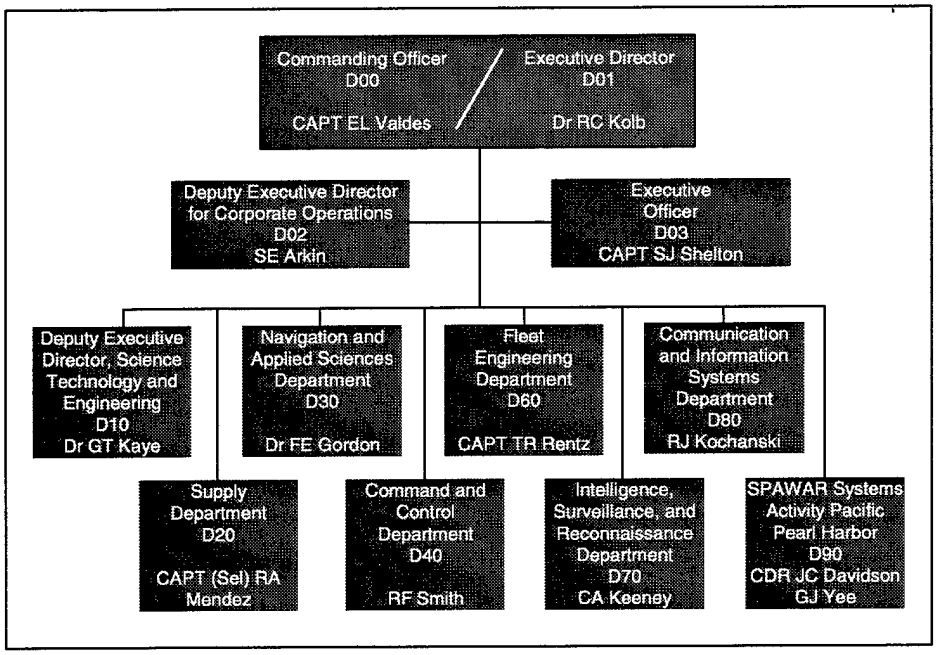

Figure 1. SSC San Diego Organization.

Administrative Developments

Funding

Total funding by sponsor (see Figure 2) for SSC San Diego for FY 00 was 1,315M. Figure 3 shows total funding by type. Figure 4 shows distribution of costs. Figure 5 shows total funding by department.

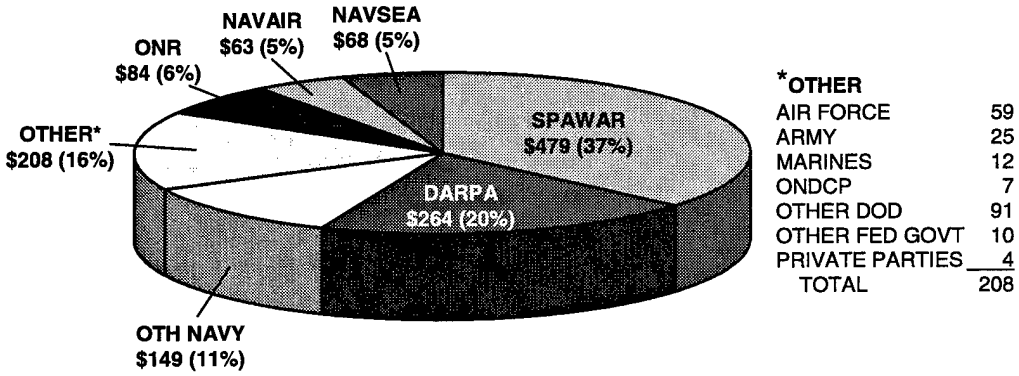

Figure 2. Funding by Sponsor, FY 00.

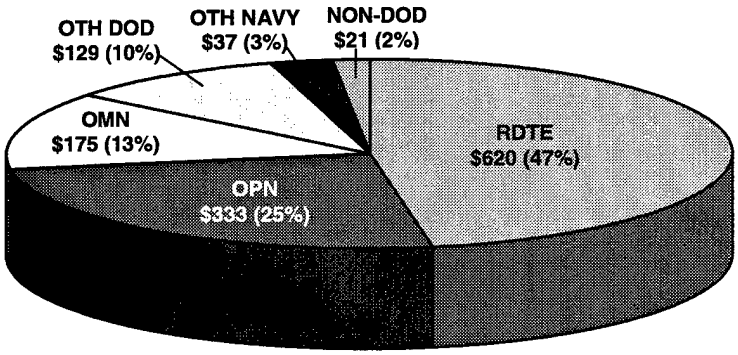

Figure 3. Total Funding by Type, FY 00.

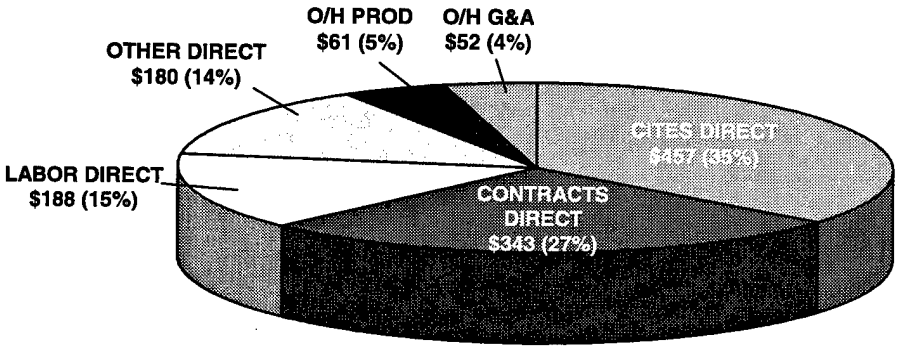

Figure 4. Distribution of Costs, FY 00.

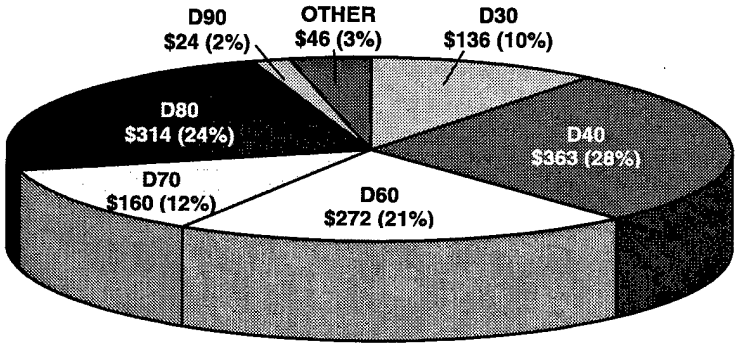

Figure 5. Total Funding by Department.

Organizational Changes

Procurement Support Office Established[1]

On 12 June 2000, the Procurement Support Office (PSO) was officially established to improve financial and contract support to the technical codes. At that time, the Financial Control Office (D02112) and the Technical Assistance Office (D21T) were officially co-located. The PSO shares a common process to serve as the focal point for processing procurement packages with "one face to the customer."

Procurement packages are reviewed simultaneously, versus serially, by the reviewing offices of Financial Control, Information Resources Management (IRM), Office of Patent Counsel, security, Technical Assistance Office, and the Contracting Branch. Creation of the PSO was a response to the Center-wide push for improvements in customer service.

Financial and technical customer service representatives from the Technical Assistance Office (D21T) and Financial Control (D02112) were assigned to support each department. This designated person, and an assigned alternate, is the primary contact for all procurement packages.

Commercial Activity Decision[2]

SSC San Diego won the first round of Commercial Activities (CA) studies as the decision for performing base supply operations, support, physical distribution, and warehousing went to the government work force.

On 31 March 2000, SSC San Diego Commanding Officer CAPT Ernest Valdes announced the tentative CA study decision to perform the warehousing function using the Most Efficient Organization (MEO) of in-house personnel. The decision became final on 31 May 2000. The former Physical Distribution Division of the Supply and Contracts Department became the Physical Distribution Operations Team, D20C.

The government estimate for performing the work under review was $5.8 million, $60 thousand less than the proposal submitted by the private bidder. The number of SSC San Diego employees required to perform this work will be reduced, allowing the government to compete with private industry. At the start of the study, 49 civilian positions were identified. The MEO will have 29 civilian positions. As a result of this study the government could save as much as $4 million over 5 years.

The MEO team will operate differently than the previous organization in a way specifically designed to improve customer service. The old organization was broken into specific sections dedicated to performing only one function at one location. The MEO enables Wage Grade employees in the MEO to perform D20 physical distribution functions: receiving, delivery, packing, controlled storage and excess, at either the Point Loma or Old Town locations.

Four transportation agents, two at each location, perform the shipping function.

All team members underwent an intense training program to transition to the MEO. Training encompassed all functional areas and included computer training, formal classroom training, and on-the-job training.

Personnel

Personnel Onboard

Total personnel onboard as of 30 September 2000 was 3498 (see Figure 6).

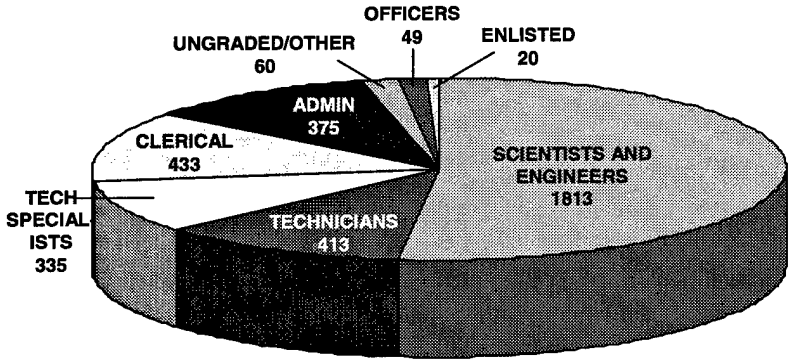

Figure 6. Personnel Onboard, FY 2000.

Major Personnel Changes

Deputy Executive Director for Corporate Operations[3]

Deputy Executive Director for Corporate Operations (D02) Hop Porter retired after almost 40 years. As head of D02, Porter was responsible for the business functions that support the technical programs of the Center. Porter provided oversight of the Center's overhead budget; direction and oversight of organization development and personnel actions; and direction and/or advice to the department heads, executive director, and commanding officer on all aspects of SSC San Diego's operation. He managed the Budget and Accounting Office, Information Technology Division, Personnel Management Support Office, and the Technical Information Division.

Mr. Steve Arkin became the head of D02 in October 2000.

Supply and Contracts[4,5]

Supply and Contracts Department (D20) Head CMDR Bruce Green retired from the Navy 1 September 2000. His retirement ceremony was held 28 July 2000. CMDR Green joined SSC San Diego in October 1998 and managed a contract organization that grew steadily in business. The contract branch let contracts that made it roughly the tenth largest in the Navy. The purchase card program is the third largest in the Navy. Despite the increased business, CMDR Green's department reduced its number of personnel by over 11 percent to keep service center costs down and support the overall objective of reducing Center overhead and work year rates.

In October 2000, CAPT (Sel) Rich Mendez became the new head of the Supply and Contracts Department. Before coming to SSC San Diego, CAPT Mendez served in the SPAWAR Contracts Directorate as Headquarters/Field Liaison and Policy Oversight branch head.

Fleet Engineering Department[6]

In May 2000, CAPT Tom Rentz became the new head of the Fleet Engineering Department (D60). Prior to coming to SSC San Diego, CAPT Rentz was the Afloat Installations Manager at SPAWAR.

Intelligence, Surveillance and Reconnaissance Department[7]

Carmela Keeney was named head of the Intelligence, Surveillance and Reconnaissance (ISR) Department (D70) and promoted to the Senior Executive Service. Previously, she was the senior manager of the ISR Department responsible for a broad program of research, development, test, and evaluation, and life-cycle support for ISR systems.

SPAWAR Systems Activity Pacific[8]

Charles Moussa was named technical director of the SPAWAR Systems Activity Pacific Yokosuka, Japan (D92TD). Moussa was formerly the deputy of operations for the Fleet Engineering Department (D60), where he was responsible for broad in-service engineering activity programs and fleet installation support.

Center Initiatives

Annual Technical Board[9]

Eighty personnel from the Center attended the annual Technical Board meeting 22 to 23 May in Borrego Springs. The meeting was initiated two decades ago by the Technical Director of the SSC San Diego predecessor Naval Ocean Systems Center to provide a venue for senior managers to exchange ideas and share information.

In CY 2000, the attendance of department and division heads was expanded to include some department administrative personnel and the members of the Center's Improvement Integration Working Group (IIWG).

Major components of the 3-day meeting were a presentation on the Enterprise Resource Planning (ERP) program, a panel discussion of department-level organizational improvement initiatives, and challenge team discussions.

The challenge teams examined issues or initiatives of significance to the Center. The challenges included issues related to strategic business processes; the Center's C^4ISR, surveillance and reconnaissance vision; core competencies of facilities, workforce and Horizontal Integration; ERP; internal communications; and the in-service engineering agent (ISEA) roles and responsibilities of SSC San Diego.

Randy Volker, the change manager for the ERP program, made a detailed presentation on the planned effort, which will impact all Center data input, collection, processing, storage and retrieval functions, and therefore all business processes. See related article in this history.

A new feature of the CY 2000 Tech Board was a panel discussion by department heads Dr. Frank Gordon, Carmela Keeney, Bob Kochanski, and Rod Smith relative to their department efforts on organizational improvement. As of June 2000, the effort had already involved almost 1,000 employees in a Center-wide program to improve effectiveness in responding to sponsor requirements by using a consultative leadership approach that seeks the widest possible employee participation.

Center Commanding Officer CAPT Ernest Valdes led a discussion on the leadership philosophy for the Center. He stated, "Our goal is for ALL HANDS—every employee—at the Center to take on the role as a leader. It is not good enough for just management to do this. We need every person at the Center to develop and possess technical skills and management acumen, and to demonstrate initiative and strong leadership skills on a daily basis. Tech Board is not just about information sharing and strategic issues; it is about getting us to collectively find ways, and establish processes, that will make SSC San Diego a world class organization, and for the Center to develop and deliver to the warfighter the best tools we can to help our forces fight and win."

Other presentations during Tech Board included one by Dr. Tom Kaye on the "Capabilities for Navy After Next" and one by Rod Smith on Horizontal

Integration, which will impact the majority of the technical programs of the Center. Jeff Grossman showed the new version of the Command Center of the Future video, "The Eye of the Storm," and discussed the representation of future technologies benefiting the joint warfighter depicted in that video.

Center Leadership Philosophy[10]

SSC San Diego management, recognizing the need for significant change, began a series of initiatives to ensure that the Center's future will be as successful as its past. Organizational improvements aimed at greater involvement of the workforce in all aspects of the Center's business, new data tracking systems to improve financial processes and resource management, initiation of an ambitious new internal communication effort are aimed at continuing the Center's record of achievement into the future.

The cornerstone of these initiatives is the Center Leadership Philosophy. The objective of the leadership philosophy is to enable greater self-direction by every member of the workforce, by defining and setting boundaries on the behavior of managers, supervisors and anyone exercising formal authority.

During the year, Center managers and supervisors met with their work groups to discuss this leadership philosophy. The discussions were intended to facilitate dialogues within those work groups, encourage each member to express his or her opinion, foster teamwork as the recognized means of producing superior results, and allow teams to negotiate how the group can work in accordance with the principles stated in the leadership philosophy.

Development of this philosophy began at the Center's Technical Board meeting in May 1999. A "challenge team" of managers from every technical department drafted the initial statement and presented it to 75 of the Center's senior managers. Since then, several hundred SSC San Diego employees attending organizational improvement training sessions have discussed and debated that first set of leadership principles, and recommended changes.

The Center Leadership Philosophy expresses the organization's beliefs in itself and its workforce. It describes employee attitudes and motivation, and the manner in which the Center conducts its business. The philosophy was developed in a consultative fashion, with about a dozen leaders representing the entire organization developing an initial statement, followed by discussion among all the senior leadership, followed by discussion by several hundred

Our Leadership Philosophy

- We are a unified organization of diverse, talented, honest, dedicated, and hard-working professionals focused on providing the highest quality service and products to meet the national interest.
- We are motivated by the knowledge that the work we do is critical to the warfighter and to our nation, is technically challenging, and is conducted in an environment which promotes success.
- We share information and knowledge, encourage continuous learning and expect personal responsibility, mutual respect and integrity.
- We use consultative leadership, mentoring, teamwork, and personal initiative to foster innovation and creativity while applying common sense and best judgement. We believe that the team process produces superior results.

employees representing all levels of SSC San Diego, and finally by formal acceptance and acknowledgment by the Executive Board.

Enterprise Resource Planning Initiative: Project Cabrillo[11]

SSC San Diego embarked on a Navy Working Capital Fund Enterprise Resource Planning (ERP) pilot initiative that will fundamentally change and substantially improve how the Center operates. ERP will allow the Center to simultaneously address the challenges of outsourcing, reducing overhead costs, and becoming more efficient at providing project support to sponsors and products to customers. "Project Cabrillo" was selected as the name for the SSC San Diego ERP Pilot Project.

The Navy Working Capital Fund (NWCF) ERP pilot, one of four approved within the Department of the Navy, focuses on improving the business operations, processes, and support systems at SSC San Diego. All four pilots have been approved by the Navy Executive Committee for Revolution in Business Affairs and the Commercial Business Practices Executive Steering Committee. SSC San Diego is the SPAWAR lead for implementing the NWCF ERP pilot. The other approved pilots are:

- Acquisition Program Management (Naval Air Systems Command (NAVAIR) lead)
- Aviation Supply Chain/Maintenance Management (Naval Supply/ NAVAIR lead)
- Regional Maintenance (Naval Sea Systems Command lead)

ERP provides for the integration of business processes and information across a business enterprise. Business process re-engineering is a critical activity of any ERP implementation. These re-engineering efforts define and improve end-to-end processes. Commercially available ERP software, consisting of configurable tools that tightly integrate data across traditional functional business lines (finance, procurement, human resources, project management, etc.), is used to implement these business processes.

The key to any ERP architecture is an integrated data environment that provides for single data entry points and near real-time view of all aspects of an organization's business situation. This allows a user to access and interact with all pertinent information using a set of software tools interfaced with a unified database. The combination of end-to-end business processes, implemented in an integrated ERP software suite, will provide consistent, accurate, and timely information to our decision makers at all levels of the organization.

The NWCF ERP Pilot

A business case analysis for this initiative, completed in 1999, determined that addressing several functional areas of our enterprise would achieve the most operating cost reductions and improvements in the efficiencies and effectiveness in our business operations. The NWCF ERP pilot will address the integration of overall SSC San Diego business practices and processes including:

Strategic Planning; Project Management; Financial Management; Procurement Management; Asset Management; and Human Resource Management.

This effort is managed by the SSC San Diego ERP Program Office, (D028), with a project team assembled from across the Center. It is expected that initial ERP capability will roll out starting in May 2001. As this occurs, over 30 SSC San Diego legacy business systems will begin to be retired with associated cost savings.

ERP Software Suite

The R/3 product from SAP, an international ERP software company, was selected as the ERP software suite. ERP systems generally use commercially available software, such as the SAP software package SSC San Diego selected. They enhance performance by increasing efficiency and cutting costs. ERP systems accomplish these benefits by enabling people to share data in near real-time across the organization. This results in more timely decision-making, better process integration, and more accurate measurement of performance for the entire business enterprise.

System Integrator

PricewaterhouseCoopers was selected as system integrator for SSC San Diego's ERP. PricewaterhouseCoopers is a global leader in ERP implementation, integration, and the application of business process re-engineering (BPR) to achieve business solutions. PricewaterhouseCoopers will play a key role, working with SSC San Diego members in the project team to re-engineer business processes quickly and effectively. They bring a proven methodology, "Ascendant," which provides the policies, procedures, best-practice processes, tools, and techniques that are necessary to make projects like this successful. They have over 500 successful implementations to date.

ERP Project Phases

Project Kickoff. An overview briefing of the ERP program at SSC San Diego was presented during the Executive Summit on 15 June 2000. This meeting welcomed aboard the contractor team for systems integration consisting of PricewaterhouseCoopers (PwC), Computer Sciences Corporation (CSC), Unified Industries Incorporated (UII), SAP, and Logicon, Inc.

Project Preparation Phase. In June and July 2000, Project Cabrillo completed the Project Preparation phase for the implementation of SAP R/3. During the Project Preparation phase, the core project team was selected and trained on basic SAP functionality. Each of the sub-teams (Business Process, Change Management and Technical Infrastructure) determined what activities were in scope for the Project Charter and developed strategy documents to guide that work.

Business Blueprint Phase. On 8 August 2000, the project Steering Committee held its first meeting to review the Project Charter and deliverables, and to initiate the Business Blueprint phase. The purpose of this phase was to document

the Center's business process requirements and describe how the organization intends to run its business within the R/3 System.

Participants from the technical codes were brought on as "Extended Members" to represent the complete range of business concerns for the organization. Upon completion of basic SAP training, they took part in Business Blueprint Workshops conducted in August and September. During this phase, the Business Process Teams mapped the business processes and designed the requirements for configuring the new system.

One of the main deliverables for the Business Blueprint phase was the Project Charter. This document summarizes Project Cabrillo plans for the life of the project. The Project Charter was presented to the Steering Committee on 8 August, where it was discussed and approved. The Project Charter was briefed to the entire Project Cabrillo Team on 22 August, and team members formally signed the Project Charter.

Realization Phase. Approval to proceed with Phase 3, "Realization," was granted by the SSC San Diego Steering Committee on 3 October 2000. To be completed by March 2001, the Realization phase consists of the actual construction of the templates that will be used in the SAP R/3 implementation. During the phase, configuration and prototyping will be done together with testing of conversion and interface programs, and finally, integration system testing.

A Project Cabrillo ERP Initiative Brief was held on 24 October. A formal Questions and Answers session took place after the presentation. In November, the Change Management Team interviewed Stakeholders to address their concerns and to determine their preferred methods of communication.

Final Preparation and Go Live Phases. The Final Preparation is scheduled to begin in March 2001, with the "Go Live" phase to begin in May 2001.

New Major Business Thrust: Single Integrated Picture[12]

Recognizing the critical role of the Single Integrated Picture (SIP) in future naval warfighting, the Center Business Development Board (BDB) established SIP as one of the Center's major business development thrusts. To identify and pursue business opportunities in this area, a SIP business development steering team, composed of representatives from each of the Center's technical departments, was established.

Future naval platforms will be required to interact and collaborate with each other to a much greater extent as the Navy moves toward network centric operations. Such a highly coordinated and team-like approach to conducting warfare operations has been shown to provide faster and more effective defense against current and projected future threats. One of the fundamental elements required to enable such teamed-warfare is each participant's possession of a picture or view of the battlespace that is common and consistent with the pictures of the other participants. It is this shared, comprehensive picture

that is referred to as the SIP. Without that critical shared view of the battlespace, there is no way for the geographically dispersed platforms to know that they are communicating about the same object. This could result in ambiguities that lead to confusion, failure to destroy desired targets, and potential fratricide.

One of the actions elected by the SIP business development steering team was active participation in the National Defense Industrial Association's (NDIA) study, "Roadmap to the Single Integrated Picture." This study was commissioned by Vice Adm. Conrad Lautenbacher, Deputy Chief of Naval Operations (OPNAV) for Resources, Warfare Requirements, and Assessments. It will provide OPNAV with a roadmap to address the technical and acquisition process challenges of fielding a SIP capability.

Corporate Business Development Leaders[13]

Traditionally, most new business is developed through bottoms-up entrepreneurial marketing to existing customers. However, for a variety of reasons, including decreasing research and development budgets and changing acquisition paradigms, the Center decided to provide new emphasis to marketing with a top-down corporate perspective.

Consequently, the Center's Business Board approved a new Corporate Business Development Plan to grow new business and cultivate new customers by utilizing more cross-departmental business teams. Strengthening the Center's corporate perspective by increasing cross-departmental teaming, cooperation and information exchange is central to the new business plan.

The business plan seeks to promote change in three primary ways. First, SSC San Diego will become a higher performing organization with increased efficiency that allows the Center to do more with the same number of people. Second, SSC San Diego will team or partner with other organizations in order to do more work. Finally, the Center will shape its portfolio of technical projects to ensure that new work is core to vision and mission areas.

The Business Development Board is principally responsible for executing and overseeing the plan. But success will largely depend on the efforts of designated business "champions," termed Corporate Business Development Leaders (CBDLs). These business leaders will operate from a Center-wide perspective. Their principal duties will include conducting business analyses, developing strategies and plans, coordinating new initiatives, leading business development teams, cultivating customer relationships, and promoting information exchange.

The following business areas were selected in recent years to be managed as portfolios:

- Unmanned Air Vehicles
- U.S. Coast Guard C^4ISR
- U.S. Marine Corps C^4ISR S&T
- Crisis Response/Consequence Management

- New Ship Construction (DD 21, CVN 77, Joint Command and Control Maritime)

Unmanned Air Vehicles (UAVs). Unmanned systems, particularly UAVs, are becoming vital C^4ISR components. Kosovo operations demonstrated both the value and shortcomings of UAV usage. UAVs will continue to evolve into cost-effective augmentation of manned air reconnaissance.

U.S. Coast Guard (USCG). During time of war, the Coast Guard may transfer from the Department of Transportation to the Department of Defense (DoD). In non-war periods the USCG often works with DoD assets for drug interception operations and in contingencies like Desert Storm.

U.S. Marine Corps Science and Technology (S&T). Littoral operations are vital for current and future crises. The USMC business area includes S&T programs, involvement in major USMC acquisition programs (USMC Unit Operations Center, Air Defense Program, ground combat programs), requirements development, joint interoperability, and systems engineering.

Crisis Response/Consequence Management. Response to a national threat requires C^4ISR architecture to support information and decision management from prevention through crisis and consequence management. Military and civilian emergency responders need to plan courses of action and rapidly execute operations in dynamic and complex environments.

Three new portfolios were designated in FY 00:

- Time Critical Strike
- Air and Missile Defense
- Information Operations/Assurance

Time Critical Strike. The four services are defining a capability to perform time critical strike to deal with expeditionary warfare when ground forces have limited artillery ashore.

Air and Missile Defense. The Ballistic Missile Defense Organization must develop/deploy capable theater missile defenses to meet the existing missile threat to deployed U.S. and allied forces; develop options to deploy a national missile defense for the U.S.; address Cruise missile defense needs and support research on more advanced ballistic missile defense technologies to keep pace with the threat and improve performance.

Information Operations/Assurance (IO/A). IO/A includes many technologies and applications: information assurance, computer network defense, computer network attack, psychological operations, perception management, and knowledge superiority.

HPO Seminar[14]

During CY 2000, the Center continued to offer the "Building High-Performance Organizations (HPO) for the Twenty-First Century" seminar. The seminar is 3 days of instruction, discussion, and workshop exercises. Participants learn how successful organizations build higher performance into the way they

organize, plan, and act. The seminar surveys a variety of topics introducing some vital lessons derived from practical experience, as well as research that has been conducted over recent decades by management experts. The seminar's main topics include:

- Definition of high performance
- Six organizational "change levers"
- Consultative and participative leadership
- The importance of leadership philosophy
- The networked talent model
- Key performance outcomes: money, customers, quality, and values
- Learning to diagnose your organization to effect improved performance

The high-performance seminar was developed by Dr. John Pickering of the Commonwealth Center for High-Performance Organizations. He and his colleague, Gerry Brokaw, are the principal presenters. Overall, the seminar provides participants with a set of diagnostic tools they can use to understand and target areas for improvement in their own performance and the performance of the whole organization.

The seminar was introduced to SSC San Diego early in 1998. Momentum picked up in 1999 when applicants were sought among SSC San Diego employees to assist presenting the HPO seminar, as well as to help graduates make practical use of the ideas presented.

Since the HPO seminar was first held at SSC San Diego, ideas discussed in the seminar have entered into common use by many employees striving to improve work performance. With the number of employees who have completed the seminar now at more than 1,100 (as of May 2000), SSC San Diego plans to continue offering the seminar to more employees with an emphasis on bringing in current or planned work groups and teams. This approach facilitates the immediate application of the course material in the workplace.

Mentoring Program[15]

SSC San Diego's Workforce QMB developed and recommended an informal mentoring program to encourage employees to voluntarily participate. A web site gives information, answers questions, provides suggested guidelines, and offers a way to connect people who are interested in mentoring or being mentored. To help potential mentors and mentees, mentoring overview classes were offered to employees.

Bankcard Reengineering[16]

In January 2000, the SSC San Diego Bankcard Reengineering Team announced a process improvement targeted at correcting several problems. The team found that the bankcard purchasing process is complex and extremely resource-intensive both front and back-end. It was determined in the process review that excessive paperwork and copying on the part of the

cardholders is required. Center overhead costs are increasing unacceptably due to an inability to properly match many purchases to the appropriate job order numbers. The recording of bankcard purchase costs is neither timely nor accurate.

The new process provides an automated Business Data Input (BDI) application for inputting, tracking, and reconciling purchases. The improved process reduces workload and eliminates redundant processes required on the part of the cardholder while improving the timeliness and accuracy of costs recorded against job orders. It eliminates tracking and reconciling purchases in the Defense Industrial Financial Management System (DIFMS) and Queries and Reporting. It reduces excessive paperwork required for post-audit reviews and reduces the potential loss resulting from unmatched purchases.

The Bankcard Reengineering Team was chartered by the Finance Quality Management Board (QMB) to recommend improvements to the bankcard purchasing process. The team was composed of representatives from every department as well as cardholders, approving officials, finance, and administrative personnel.

A General Overview brief and a Detailed Process Overview brief of the reengineered process was provided for all cardholders, approving officials, administrative personnel, and program managers. Overviews were also scheduled for employees located in Hawaii and Philadelphia, Pennsylvania.

HPCMP PET Program[17]

In 1999, SSC San Diego began planning a series of on-site introductory and advanced MATLAB scientific computation Programming Environment and Training (PET) courses that could be offered at no cost to the Center. The PET Program is an initiative of DoD's High Performance Computing Modernization Program (HPCMP).

A key objective of the DoD HPCMP PET Program is to continuously expand and train the DoD high performance computing user base through innovative education and training programs, collaboration, tool development, and outreach. With the aid of this program, hundreds of DoD scientists and engineers have been trained at no direct cost to their organizations.

From January through August 2000, the SSC San Diego hosted a series of MATLAB courses taught by a team of professors from Ohio State University through the auspices of the U.S. Army Research Laboratory (ARL). Seven MATLAB courses were given: four 2-day introductory courses; two 1-day advanced signal-processing courses; and a 1-day advanced image-processing course. Over 100 SSC San Diego scientists and engineers from four technical departments attended these intensive hands-on courses.

The benefits of the HPCMP PET program have been significant to the DoD technical community and, as evidenced by the participation in the MATLAB courses, to SSC San Diego. Through the courses at SSC San Diego, Center scientists and engineers have improved on and advanced their numerical

computation, signal, and image processing skills to solve the increasingly challenging and complex Navy and DoD problems in our primary mission areas of command and control; communications; surveillance and navigation; and applied sciences. A corollary benefit is that these seven PET courses have been instrumental in increasing the level of interactions among Center scientists and engineers, hence paving the way for future interdisciplinary HPC collaborations.

Community Involvement

Scholarship Established In Memory of Arctic Submarine Pioneer[18]

On 20 June 2000, a scholarship was presented honoring the memory of the late Dr. Waldo Lyon, whom many regard as the "father of the submarine arctic warfare program." Dr. Lyon worked 55 years for the government, and 51 of those years for SSC San Diego's predecessor organizations.

The scholarship was presented for the first time to a doctoral candidate whose research has focused on the field of plasma physics. The scholarship was instituted to preserve the memory of Dr. Lyon and his contributions to the Navy. It will be given on an annual basis to a deserving physics student at Dr. Lyon's alma mater, University of California Los Angeles.

Pollak Provides University Library Endowment[19]

The California State University Fullerton named their library for emeritus English professor Paulina June Pollak and her husband George Pollak, who gave a $1 million library endowment. Pollak retired from the Center in 1984. He was head of the Management Assistance Office at predecessor organization Naval Ocean Systems Center at the time of his retirement.

National Society of Black Engineers (NSBE) Industry Night

Dr. Clifton Phillips (SSC San Diego D853) was the keynote speaker at the NSBE Night of Industry. The Night of Industry was held at the University of California, San Diego (UCSD), on 12 October. This event was well attended by UCSD Science and Engineering majors, students from Society of Women Engineers, Society of Hispanic Professional Engineers, and several southwestern U.S. companies.

Student Programs

2000 MESA Shadow Day[20]

SSC San Diego participated in the San Diego State University "2000 MESA Shadow Day." Mathematics, Engineering, Science Achievement (MESA) is a math and science enrichment program that works with urban high school and university students. The "2000 MESA Shadow Day" provided a unique opportunity for two students from Lincoln Preparatory High School to experience

the "real world" of a career in a technological or scientific environment. Each student was assigned to accompany one of SSC San Diego's science and engineering professionals for the day. Volunteer mentors for the program this year were members of the Signals Technology Branch (D841) and Synthetic Forces (D44206).

MESA, founded in 1970, serves educationally disadvantaged students and, to the extent possible by law, emphasizes participation by students from groups with low eligibility rates for 4-year colleges. MESA is a program of San Diego State University and the University of California. It provides a pipeline of academic services from elementary through university levels to increase the number of students who graduate with degrees in math, science, and engineering.

Currently, 400 students are enrolled in the San Diego State University MESA program. More than 85 percent of MESA high school graduates go on to college. Of the MESA graduates who enroll in colleges and universities, the majority of graduates have chosen majors in math or science-related technical fields. MESA students are twice as likely to pursue careers in physical sciences, and three times as likely to pursue an engineering career.

C.H.U.M. Mini-Camp

Dr. Clifton Phillips (SSC San Diego D853) participated in the Consortium of Community, High Schools, Universities and the Medical School (C.H.U.M.) Christmas Science Fair Mini-Camp. This event was developed to provide technical and material support to disadvantaged youth endeavoring to complete and compete in the Greater San Diego Science and Engineering Fair. This year almost one hundred ninth grade students from six schools participated for 5 days and accessed UCSD Science classrooms and laboratories to work on their specific projects. C.H.U.M. provides opportunities for K-12 students to become interested in science. Dr. Phillips taught these students how to detect molecular compounds using a spectrometer and measure the pH of solutions. Students will use these measurement skills in their research.

Technical Highlights

Deputy Executive Director, Science, Technology and Engineering (D10)

In-House Laboratory Independent Research (ILIR)

The In-House Laboratory Independent Research (ILIR) program at SSC San Diego enables SSC San Diego to perform innovative, promising research consistent with its mission and with the policies of the Chief of Naval Research and the Department of the Navy (DoN). The ILIR program is implemented at SSC San Diego under the authority of the Deputy Executive Director for Science, Technology and Engineering and is managed by the Science and Technology Office. Total funds of $2,406,481 were provided in FY 00. In addition, $300,000 was carried over from the FY 99 program and used to begin restructuring aimed at increasing program impact.

The ILIR program at SSC San Diego is being restructured to increase the impact of limited ILIR resources. This reorganization will increase the size of selected projects to focus on areas identified by our corporate technical vision as most critical to the SSC San Diego mission. When fully implemented, there will be three to six large team projects in progress each year. The team projects will be funded at approximately $300K per year and will generally last for 2 to 3 years. The rest of the program will comprise smaller projects, each funded at $100K to $150K per year, up from previous averages of approximately $80K each. The intent is to fund the most mission-critical projects at high levels to enable exceptional impacts, and to fund all projects at adequate levels to generate useful results. Consequently, a smaller number of projects overall will be funded in FY 01 than were funded in previous years. In FY 99, there were 29 projects with an average funding of $77K; in FY 00, there were 28 projects with average funding of $97K; and in FY 01, there are 17 projects with an average funding of $151K.

Two large team projects were initiated in FY 00: *Knowledge Mining for Command and Control Systems* and *Robust Waveform Design for Tactical Communication Channels*. For FY 00, these projects were funded at $295K and $385K, respectively. These projects are expected to continue for 2 to 3 years, and additional team projects will be selected in FY 01 and subsequent years.

In terms of productivity statistics, the FY 00 ILIR program was very successful, with a total of 89 papers/proceedings/books/dissertations published or submitted and 62 presentations made by SSC San Diego ILIR investigators. There were also 7 ILIR-related patents, 15 patent applications, and 18 patent disclosures produced during FY 00.

Oversight responsibility for the ILIR program was moved to the Office of Naval Research (ONR) Chief Scientist's Office in October 1999. This move resulted in a complete revision of program guidelines. The new guidelines stress increased collaboration and participation of new scientists and strongly encourage teams of investigators to work on projects of sufficient scope and

risk to have a potentially significant impact on DoN priorities. The initiatives implemented by SSC San Diego in FY 00 and FY 01 programs are responsive to the new guidance from ONR.

Software Engineering Policy[21]

SSC San Diego Commanding Officer CAPT Ernest Valdes issued All Hands Note 16 announcing two new SSC San Diego policies: (1) test and evaluation and (2) software engineering (described below).

Software Engineering Process Policy

SSC San Diego's Software Engineering Process Office (SEPO) is tasked to facilitate the implementation of SPAWARSYSCENINST 5234.1 Software Engineering Process Policy. Software Process Improvement (SPI) Agents, who are part of the SEPO SPI network, are assigned in each of the departments and are available to assist Center personnel in implementing the policy on their projects.

The Software Engineering Process Policy is the cornerstone of the Center-wide Software Process Improvement Initiative that was officially established by SSC San Diego Executive Director Dr. Bob Kolb in November 1998. The purpose of this initiative is to improve the Center's software engineering core competency and to support our strategic objective to improve software project management and software engineering.

The primary objective of the SPI program is to satisfy goal one by raising SSC San Diego's software engineering core competency to a higher maturity level in accordance with IEEE/EIA 12207 Life Cycle Processes Standard and the Software Engineering Institute's Capability Maturity Model for Software (SW-CMM). Lessons learned from others engaged in SPI show that the achievement of this first goal will enable the satisfaction of the other five goals. It is important to note that the first goal has two objectives: first to achieve the capability defined through SW-CMM Level 3, and second to get the associated rating of SW-CMM Level 3.

Capability Maturity Model Level 3[22]

In a ceremony on 25 October 2000, presided over by SSC San Diego Executive Director Dr. Bob Kolb and the SSC San Diego Business Board, the Center celebrated its recognition for an outstanding center-wide accomplishment. A Software Capability Evaluation (SCE) Team, led by the Defense Contracting Management Agency (DCMA), awarded the Center a Capability Maturity Model for Software (SW-CMM) Level 3. Additionally, the SCE indicated that the Center has achieved many of the requirements of Level 4 and Level 5.

SSC San Diego's software process efforts date back many years. In response to a 1988 assessment done on predecessor Naval Ocean Systems Center by the Software Engineering Institute (SEI) at Carnegie Mellon University, the Software Engineering Process Office (SEPO) was established. SEPO's

original tasking was to help anyone, anytime, with any question about software engineering. In 1998 Dr. Kolb officially established the Center-wide Software Process Improvement (SPI) initiative for SSC San Diego.

The purpose of this initiative was to improve the Center's software engineering core competency and to support its strategic objective to improve its software project management and software engineering. Dr. Kolb and the department heads declared six software-engineering goals for the Center. The first was to achieve a SW-CMM Level 3 capability as a milestone for SW-CMM Level 5. The new mission for SEPO was to facilitate software process improvement across the Center to achieve first a Level 3 and then a Level 5. The SW-CMM Level 3 accomplishment represents a major milestone in satisfying this goal.

An SCE is a rigorous and intensive 2-week in-depth evaluation of how well an organization implements the guidelines in the SW-CMM. It measures the software engineering capability of both the organization and the projects. SEPO, as the focal point for the organization, developed a set of organization best practices that can be tailored to any project's needs and provides training in how to implement them.

The projects that participated in the SCE were:

- Navy Key Management System, led by Gary King, Information Assurance Systems Engineering Branch (D873); Common Tier 3, led by Dan Lam (D873)
- Marine Corps Air Traffic Control and Landing System, led by Ron Ballard, Air Command and Control Branch (D336)
- Joint Network Design Agent, led by Bob Nydam, Systems Engineering (D4521)

The other pilot projects scheduled to participate in upcoming evaluations are:

- Office of the Deputy Executive Director for Corporate Operations (D02) Management Information Data Warehouse: Query and Reporting
- Navigation and Applied Sciences Department (D30): Control Display Navigation Unit; Navigation Sensor System Interface; Joint Southern Surveillance Reconnaissance Operations Center
- Command and Control Department (D40): Global Command and Control Systems-Maritime; Joint Simulation System-Maritime; Naval Fires Control System
- Fleet Engineering Department (D60): Joint Tactical Information Distribution System; Hunter
- Surveillance and Reconnaissance Department (D70): Software for Signals Intelligence; Combat Direction Finding, Intelligence
- Communication and Information Systems Department (D80): Information Screening and Delivery Subsystem

The SCE Team was led by David Zentner of DCMA and included Charles Bush and Richard Sierzant, also of DCMA. SSC San Diego was represented on the team by Mike Moser, Command, Control, Communications, Computers

and Intelligence Systems Engineering and Integration (D4221); and Joe Reyna and Brian Groarke of SEPO.

Both the SW-CMM model and the SCE methodology were developed by the SEI. The Department of Defense established the SEI in 1984 to create standards of excellence for software engineering and to accelerate the transition of advanced technology and methods into practice. The SW-CMM was developed as a way to characterize the capabilities of software development organizations. The main objective of an evaluation is to determine the strengths and weaknesses of an organization's software engineering capability, thereby highlighting their areas of risk.

Hundreds of organizations have proven that risk is lowered and the predictability for producing high-quality products is increased while lowering the costs and schedules by practicing the tenets of the SW-CMM. Per statistics from the SEI web page as of August 2000, they have had 901 organizations voluntarily report their SW-CMM Levels that were determined by SEI certified evaluators. SSC San Diego is now in the top quartile of those organizations. Of those 901 reporting organizations, 65 were military services of which one is a SW-CMM Level 5, five are a SW-CMM Level 4, and nine are a SW-CMM Level 3. Only one other military service organization had more than 2000 employees and no others reported being a research and development facility.

The pilot project managers who were in the SCE agreed that SPI improved their projects by producing more complex builds in less time. Implementing peer reviews and other process improvements significantly reduced the problems found, and the efforts expended, in testing. Through process maturity they observed increased productivity. They said that project people would not work on another project without defined processes, that SSC San Diego is now consistently producing builds with zero defects, and they have been awarded new work based on SPI efforts.

Navigation and Applied Sciences Department (D30)

Enhanced Position Location Reporting System Demonstration[23]

Naval Sea Systems Command Amphibious Warfare (PMS-377) and the SSC San Diego Joint Tactical Systems Branch (D337) provided a demonstration of the Enhanced Position Location Reporting System (EPLRS) at the Fleet N6 Conference held in San Diego from 13-15 June 2000. The primary demonstration elements were the net control stations (NCS), AN/KSQ-1 Amphibious Control System, Position Location Information-Character Oriented Message (PLI-COM), EPLRS data communication capability, and Situation Awareness Data Link. All of the elements were located in a simulated field environment complete with camouflage netting and a High Mobility Multipurpose Wheeled Vehicle (HMMWV) EPLRS NCS.

The EPLRS NCS are installed on the LHD Amphibious Assault Ship (Multipurpose) class ships and airborne relays extending EPLRS coverage from over-the-horizon at-sea to several hundred kilometers inland. EPLRS navigation and communications services can be provided to a Marine expeditionary unit over a continuous battle space without disruption. This makes EPLRS the unique provider of accurate position location information of ground support elements with associated robust, secure, and high-speed digital communications.

Interacting with the conference participants provided the EPLRS support team welcome inputs regarding the operational use of the system in addition to interest in the technical details of how EPLRS performs its functions. In particular, CAPT Michael Felmly, U.S. Naval War College confirmed the importance of accurate position location of friendly ground forces in conducting littoral operations. His comment, "We lose track of the ground element early in the assault phase," supports the notion that the navigation capabilities provided by EPLRS are equal in importance to the communications capabilities.

AN/KSQ-1 demonstrated the effectiveness of using the PLRS/EPLRS generated position location information of an amphibious readiness group (ARG). This included the landing craft air cushions (LCACs) overlaid on a Global Command and Control System–Maritime (GCCS–M) digital map background. This directs the movement of LCACs through safe lanes to the shore and returns using the operations track and navigation aid display and the inherent communications capabilities to transmit control messages to the LCACs. Since KSQ-1 is a GCCS–M segment, input to the SPAWAR Advanced Concepts and Technologies Directorate Q-70 demonstration was also furnished by cabling the two systems together. (This element of the demonstration was presented by Tom Himebaugh and Ed Hamblin of Coastal Systems Center, Panama City, Florida.)

The PLI-COM system demonstrated a general application, personal computer-based direct connection to the user read-out port or communications port on the EPLRS radio. It receives position location information and overlays it onto a digital map background in vector format. The later capability is provided by an SSC San Diego digital map product, Caricature, which permits easy editing of a map to declutter or add/delete objects. This is extremely useful for customizing the map background to the immediate combat conditions. The most significant contribution of this product is to position tracks on screen precisely on the map through software binding of unit and map coordinates. PLI-COM also demonstrated the tactical e-mail capability using EPLRS as the communication pipe.

Global Positioning System Anti-Jam Antenna [24]

Tasked by the Navy Navigation Program Office, SPAWAR PMW/A-187, a team of engineers under the direction of the Global Positioning System (GPS) Navigation Systems Product Development (D315) successfully completed an evaluation of a GPS anti-jam antenna aboard a Landing Craft, Air Cushion (LCAC) platform. GPS, the satellite navigation system now being integrated aboard every Navy platform, is being utilized by the Navy, the other services, and U.S. allies as the principal source of navigation and time. Its accuracy, both in position and time, and its worldwide availability, is unique among navigation systems.

Its importance to the military, and the fact that the signal is propagated from satellites at 11,000 miles in space, makes the GPS signal a target for electronic countermeasures by adversaries. To address GPS vulnerability issues, the Navy, along with the other services, has initiated efforts to make its GPS systems more resistant to countermeasures. The testing conducted on the LCAC was the initial Navy field testing of technologies to address the need for increased GPS robustness.

The Navy has determined that the most cost-effective, near-term solution to providing GPS receivers aboard Navy aircraft and ships with enhanced resistance to electronic countermeasures is the use of anti-jam antennas. These antennas use multiple receiving elements, along with associated processing in antenna electronics units to reshape the reception pattern of the antenna based on jammer power location and strength. This has the effect of reducing incoming jamming power to the GPS receiver while strengthening satellite power to the receiver. The specific antenna system evaluated for the LCAC is the GAS-1 antenna system. This system is manufactured by Raytheon Systems Limited of Harlow, United Kingdom.

The LCAC is a high-speed fully amphibious landing craft that travels on an air cushion on water as well as land. The LCAC has a primary mission of amphibious warfare. Alternate missions include mine clearing and personnel transport. Its mission need for high navigation accuracy and its proximity to hostile areas makes the LCAC a prime candidate for GPS anti-jam enhancements.

The evaluation program structured by the Global Positioning and Navigation Branch (D31) was organized to focus on the unique issues associated with antennas used in the at-sea environment and capitalize on previous data collected for Air Force integration efforts. For shipboard installation of this antenna, SSC San Diego designed and fabricated a ground plane assembly to support installation of the antenna above the ship structure and house the antenna electronics in a waterproof enclosure.

The Applied Electromagnetics Branch (D851) supported the effort with modeling and simulation tools used to design and predict performance of a unique GPS ground plane design for ship installations. The design was then fabricated in the Public Works Center workshop. Following the fabrication, the prototype was tested in an anechoic chamber where results were compared against antenna data collected from a larger aircraft fuselage representative ground plane to ensure no loss of performance.

The next step in the process was to evaluate the performance of the GAS-1 in the LCAC operational environment. To prepare, GPS Navigation System Evaluation/Testing (D312) conducted performance and interface tests of the GAS-1 integrated with the LCAC GPS receiver in the D31 GPS laboratory using simulated and live satellites. This effort validated the interoperability of this antenna system with the receiver as well as checking out the test instrumentation and wiring to be used on the LCAC tests.

Under direction of the GPS Navigation Systems In-Service Engineering Branch (D314), a site survey of the LCAC was performed to determine suitable installation locations for this antenna system as well as planning for cabling and test instrumentation setup. The preferred location was then evaluated using SSC San Diego D851 modeling tools. The effects of LCAC emitters were predicted as well as reflecting surfaces, potential platform blockage, and other electromagnetic interference/electromagnetic compatibility issues on the ability of the antenna to operate properly at potential locations. Once the location was finalized, the GAS-1 was installed aboard LCAC number 66 at Coastal Systems Station (CSS) Dahlgren Division, Panama City, Florida.

The CSS personnel executed the installation and performed a checkout of the system prior to at-sea deployment and final evaluation. There were two principal questions for the evaluation of the GAS-1 anti-jam antenna. First, did it perform as well as the previous GPS antenna (a single element antenna that did not provide anti-jam protection) in a non-jamming environment? Second, did the GAS-1 provide the required anti-jam performance in a jamming environment?

The first evaluation, performance with no jamming, was executed off the coast of Panama City, Florida, where the GAS-1 and the original single element antenna were tested side by side. Upon successful completion of this test phase, it was time to evaluate the GAS-1 under jamming conditions on the LCAC. The planning for this effort was led by Charles Falchetti, D315, project manager; Dean Nathans, D315 branch head; and Jeanne Abriel, D314,

test director. Sponsorship of this effort was under the control of Bereket Tanju of PMW/A-187.

Field jamming of GPS requires special permission since so many civil applications, in addition to military, depend on GPS. This includes civil aviation, harbor navigation, and cell phone use. Therefore, approval for GPS field jamming requires an extensive process involving agencies such as the Federal Aviation Administration and U.S. Coast Guard. Impact of the requested jamming levels and locations is reviewed to ensure no significant impacts occur.

The D31 team determined that the ideal location to perform the LCAC jamming testing was at Eglin Air Force Base (AFB), Florida. Eglin was chosen for a variety of reasons, including prior experience and resources to conduct GPS jamming; extensive land and at-sea test ranges under meliorate control; and a relatively short distance from the home port of LCAC 66.

The D31 test team determined that it was highly desirable to take measurements of GAS-1 performance under jamming conditions with the LCAC on land to establish a detailed model of performance under controlled conditions not possible at sea. The Eglin AFB 46th Test Wing supported this effort with the placement of towers installed with GPS jammers around the LCAC to measure GAS-1 anti-jam performance in all directions. These data were used to refine and validate the software predictions of GAS-1 performance on the LCAC.

Upon successful execution of this test phase, the LCAC transitioned into the Eglin at-sea test range for the final phase of evaluation. For several days, the LCAC was operated under dynamic and static conditions against several shore-based jammers. The performance of the GAS-1 antenna system as well as the overall impact to the GPS navigation solution was evaluated. This testing introduced to the overall evaluation process the effects of LCAC roll and pitch motions, sea spray of the air cushion effects, as well as multi-path effects over water. These are unique conditions not previously evaluated with the GAS-1 testing on Air Force aircraft. Testing was successfully executed with the field test team.

The results of this testing will be used to support future Navy acquisition decisions for anti-jam technology for Navy ships. The LCAC allowed the most controlled environment to assess unique watercraft issues with its ability to operate on land as well as near shore waters. Data from these tests will be used to refine models and allow simulations for GAS-1 performance prediction for other ship classes such as guided missile destroyers, guided missile cruisers, and amphibious assault ship (general-purpose) where extensive, controlled at-sea jamming testing is more difficult to execute.

Anacostia Watershed Restoration[25]

The Navy and the Washington, D.C. community held a kickoff event entitled "Launching New Environmental Research on the Anacostia River." This was a new phase of research for restoration of the Anacostia Watershed. The SSC

San Diego research vessel ECOS was used by a team of five SSC San Diego scientists to map both physical parameters and chemical contaminants in the river. ECOS is equipped with a data gathering and analysis system designed by the Environmental Sciences Division (D36) called the Marine Environmental Survey Capability (MESC). The event was attended by many dignitaries including the Deputy Undersecretary of Defense for Environmental Security Sherri Goodman, Regional Environmental Protection Agency (EPA) administrator Bradley Campbell, and Commander Naval District Washington Rear Adm. Christopher Weaver.

The Anacostia River Watershed drains parts of urban Washington, D.C. and suburban Maryland, and flows into the Potomac River south of Washington, D.C. ECOS was contracted by AWTA and encouraged by Naval District Washington to perform multiple scientific studies to supplement past and current studies of the river.

Equipment aboard the vessel ECOS was used to assess the hydrodynamic conditions of the river to support ongoing and future development of contaminant fate and transport models. It measured a variety of water quality parameters in real-time to develop a synoptic map of the river. The effort also included a rapid screening of sediment contaminants to better understand contaminant dispersion and distribution and to guide further comprehensive sediment collection and analysis.

Using the MESC system, ECOS conducted extensive water quality and sediment monitoring studies to understand the dynamics of chemical contaminants in the river. MESC provided real-time data acquisition and processing for integrated, rapid, continuous measurement and mapping of hydrographic and environmental parameters in the river. MESC can measure physical, chemical, and biological characteristics from a moving vessel using state-of-the-art sensors, computer systems, and navigation equipment. This approach allows direct in-situ measurements that aid extrapolation and provides simultaneous measurements at a frequency commensurate with scales of natural and anthropogenic variability. The system provides optimal data to develop and validate hydrodynamic and contaminant transport models.

The new data gathered will help scientists understand chemical contaminant toxicity, concentrations, loading, transport mechanisms, and associated impacts on human health and the Anacostia River environment.

Command and Control Department (D40)

Fleet Battle Experiments

SSC San Diego provides support to the Navy Warfare Development Command (NWDC) for all Fleet Battle Experiments (FBEs) in the areas of systems engineering, development, integration, installation, and finance. In FY 00, the SSC San Diego Integration Team conducted design, integration, installation, and contracting support for FBEs FOXTROT (see extended write-up below), GOLF, and HOTEL. More than 150 individual contracting actions valued at over $15M were executed by the Finance Team. The Systems Engineering Team designed, integrated, and installed over 100 individual advanced technology prototypes in a host of surface, subsurface, and shore-based facilities. Surface platforms including LCC, CVN, CG, DD, DDG, SSN, and two allied combatants had distinct C^4ISR installations performed by the Systems Engineering Team. NWDC commended the SSC San Diego team as uniquely qualified to consistently provide rapid, flexible, and professional engineering and financial services under extremely demanding conditions in remote Theaters of Operations.

Fleet Battle Experiment-Foxtrot (FBE-F)[26]

In FY 00, an interdepartmental team of SSC San Diego personnel participated in Fleet Battle Experiment-Foxtrot (FBE-F), the sixth in a continuing series of CNO-directed advanced warfighting experiments designed to examine emerging technologies in actual warfighting areas of operations (AORs). Under the direction of NWDC, FBE-F was conducted in the Fifth Fleet AOR, which includes the Persian Gulf and Northern Arabian Sea. There were several aspects of the experiment, but the primary focus was on examining how advanced C^4ISR technologies could assist the warfighter in responding to a hostile closure of the Persian Gulf. Time critical (mobile) offensive weapons systems, such as SCUD missiles and the ability to counter these threats, were central to the experiment.

Another key objective of the experiment was the design and implementation of a counter weapons of mass destruction (WMD) cell that was built at Fifth Fleet Headquarters in Bahrain. Finally, the SSC San Diego team had the job of implementing an improved mine warfare architecture that would be integrated with an antisubmarine warfare exercise to allow for parallel operations vice the current serial operations used today.

The SSC San Diego team was responsible for designing and building virtually 100 percent of the C^4ISR networks that were the heart of the experiment. In addition, the team did equipment installations at several shore-based and ship-board sites. The team designed and installed the C^4I architecture, and equipment to support the Distributed Joint Fires network, which were critical to the success of the experiment. The USS JOHN F. KENNEDY Battle Group supported the experiment and several ships were configured with distributed fires cells.

FBE-F focused on joint maritime access and control to keep open the Strait of Hormuz in a time of war scenario. The experiment was conducted under the umbrella of a larger major theater war scenario called "Arabian Mace." In the event of war, it would be crucial to keep the flow of oil coming from the Persian Gulf. An enemy would be highly motivated to close that supply line through the combined and simultaneous use of mines, submarines, surface-to-surface missiles, and possibly chemical/biological weapons.

The challenge explored in FBE-F was not merely to examine ways to overcome the threat, but to consider the need to do so as quickly as possible. Today, as in the past, the Navy would approach this problem sequentially, essentially rolling back each threat in a sequence. This strategy, although effective, could take longer than global oil reserves could last and potentially create a significant global downturn.

A new concept tested in this experiment was called parallel warfare. Through the use of advanced C^4I technology and a new organizational and doctrinal design, parallel warfare allows multiple types of threats to be engaged simultaneously, thus greatly reducing the time required to regain the straits. The experiment demonstrated that parallel warfare could one day become reality for the Navy. FBE-F also highlighted progress made in chemical, biological, and radiological defense. The SSC San Diego team was instrumental in the design and installation of a WMD cell at the Fifth Fleet Headquarters. Coincident to the experiment was a visit by the General Accounting Office (GAO) to evaluate the progress made in this area of warfare. The GAO said it was the best example of cutting-edge efforts in nuclear, biological, and chemical warfare that they had seen.

Software Composability Research[27]

The Joint Task Force Advanced Technology Demonstration (JTF ATD) Project, sponsored by the Defense Advanced Research Projects Agency's (DARPA) Information Systems Office (ISO), has been researching into collaborative shared distributed complex object oriented technologies since 1995. The project was completed in CY 2000. Technologies developed as a result of this research are now allowing the warfighter to collaborate across multiple domains (e.g., operations, intelligence, logistics, transportation, etc.) and therefore synchronize crisis planning very rapidly, in hours instead of days. Thus, the technologies developed in the JTF ATD are contributing to the warfighter's ability to get inside the adversary's decision loop by allowing the warfighter to synchronize plans and actions in a collaborative and shared environment very quickly.

The research JTF ATD Project resulted in a model-driven code generation process and service that creates a toolset to enable system and application developers to build the warfighter's collaborative shared distributed complex object-oriented systems. The technology has been designated the composable Next Generation Information Infrastructure (NGII) 2000 toolset. It uses the Universal Modeling Language (UML) to describe the components of the system the developer is building along with code scripts that drive the

model-driven code generation process within the Common Object Request Broker Architecture (CORBA) environment. The researchers have found that this code generation process is extensible to Java 2 Enterprise Edition (J2EE) from Sun, as well as Extensible Markup Language (XML) and Extensible Scripting Language (XSL). Systems have been code-generated in these domains.

The model driven code generator, services, and tools developed by the JTF ATD Project for the composable NGII 2000 toolset allows the system and application developers to automatically generate infrastructure/middleware services from a UML model. It creates a framework of code that streamlines application development in a CORBA environment.

One example of the utility of the NGII 2000 toolset has been its use by the Adaptive Course of Action (ACOA) Advanced Concept Technology Demonstration (ACTD), sponsored by the Deputy Undersecretary of Defense for Advanced Technologies (DUSD (AT)), the Defense Information Systems Agency (DISA) and Commander-in-Chief, U.S. Forces, Pacific. The ACOA ACTD system and application developers are using the NGII 2000 toolset to produce infrastructure/middleware code for the latest version of their crisis planning system. This system has collaborative shared distributed complex objects with over 300 classes. The system and application developers on this project have reported that the use of the composable NGII 2000 toolset has resulted in the auto-generation of over 750,000 lines of Java code and a savings of over 4 work-years of effort to their project.

Another example of the utility of the composable NGII 2000 toolset is how it is being used to support the Multi-Sensor Tactical Data Visualization (MTV) Technology Integration Experiment (TIE) sponsored by DARPA's ISO. In this TIE, DARPA ISO is experimenting with the toolset to evaluate its utility in allowing the warfighter to visualize new sensor data as rapidly as possible. The participants of this TIE are DARPA's Tactical Technology Office (TTO) Dynamic Data Base (DDB) Project, the Battlefield Awareness Data Distribution (BADD) ACTD, and ISO's Command Post of the Future (CPoF) Project. The preliminary results are as promising as those experienced by the system and application developers in the ACOA ACTD to date. It is saving the system and application developers time and allowing the MTV developers to concentrate on building functionality the warfighter needs. It relieves the developers from having to spend most of their time building the infrastructure/middleware required to support the warfighter's visualization requirements.

The NGII 2000 toolset is intended to provide a set of building blocks that application developers can assemble into core information servers and applications to support key requirements specific to their domains. This technical infrastructure/middleware supports distributed collaboration for analysis of situations and construction of timely plans in hours instead of days. It minimizes risks and supports the execution and continuous adaptation of operations to optimize outcomes in response to changing events for the warfighter. The JTF ATD researchers achieved this by splitting the technologies into

smaller and lighter weight services, allowing them to get to the atomic level in the area of infrastructure/middleware basic services.

These technologies are a result of several years of research and are providing the system and application developer with an object oriented software toolset. This is especially necessary in today's environment where the technology of distributed object-oriented computing has exploded (e.g., J2EE from Sun, the CORBA from OMG, and Distributed Common Object Model (DCOM/COM+) from Microsoft).

The technologies being provided by the JTF ATD are not a panacea. The composable NGII 2000 toolset does allow the system and application developers to create multi-tier, heterogeneous network-based collections of components that are integrated in complex ways to provide scalable and secure business object functions. Components found at the middle levels within integrated systems benefit from common infrastructure/middleware services. This helps facilitate their initial generation by system and application developers and ensures interoperability of the overall system throughout the various component's lifecycles. The composable NGII 2000 toolset greatly automates the building of this infrastructure/middleware.

This is a fast moving area of research. There have been many advances in object-oriented technologies and associated architectural approaches. These define how to design and implement certain coarse-grained collaborative shared distributed object-oriented component functionality like persistence, transactions, and life cycle management in a very structured way (i.e., Sun's J2EE and Microsoft's MTS). The JTF ATD's research fills some of the void that system and application developers face in building the required infrastructure/middleware for collaborative shared distributed complex object-oriented systems needed to support the warfighter's geographically distributed and shrinking support structure.

Image Product Library (IPL)[28]

Image Product Library (IPL) is the National Imagery and Mapping Agency's (NIMA's) United States Imagery and Geospatial Services migration system for the storage, cataloging, and dissemination of imagery and image products. IPL is an integrated, unified, softcopy library system that supports the rapid storage, retrieval, and dissemination of digital data. It allows users such as intelligence analysts, imagery analysts, cartographers, and operations personnel to have seamless access to the imagery, image-based products, and relevant metadata they need to fulfill their respective missions.

It is being deployed to provide primary imagery and image-based products to users in a timely manner in support of the mission requirements of military commands and government sites. IPL will provide users with enhanced and increased functionality over existing systems. This program is managed by the SSC San Diego's National Imagery and Mapping Agency Support Office (D4235) located in Philadelphia, Pennsylvania.

IPL's ultimate mission is to provide the imagery community with improved accessibility, operational support, and distribution of geospatial and imagery products. NIMA's fielding plan is to deploy IPL servers at the various national sites, command levels, and tactical sites. The IPL servers are designed to interface with other imagery sources to allow queries against their holding and requests for images and/or image-based products. Some of these imagery sources are: Imagery Exploitation Support System, Demand-Driven Direct Digital Dissemination, National Information Library, and Command Information Library. Imagery holdings are accessed from various computer workstation platforms that are connected to the IPL server. IPL provides a diverse user community with transparent, timely access to a wide variety of products stored anywhere in the distributed library system.

United States European Command (USEUCOM) is the first unified and specified command programmed for full transition to IPL operations. The USEUCOM IPL transition covers USEUCOM Headquarters, Joint Analysis Center (JAC); Linked Operations-Intelligence Centers, Europe; U.S. Army, Europe; U.S. Naval Forces, Europe; U.S. Air Force, Europe; Special Operations Command, Europe; and Navy afloat platforms assigned to the European Theater.

Code D4235 provides hardware engineering, system acquisition, system assembly, hardware integration, onsite installation, customer support, logistics support, training, configuration management and life-cycle support for the Image Product Library program. The IPL hardware suite is designed around a Sun-based computer architecture supporting between 50 and 1200 gigabytes of disk storage per system. Each system is appropriately packaged for the intended operating environment and designed to meet the user's operational mission requirements. The team of government and contractor engineers, installers, logisticians and support personnel have successfully designed, fielded, and established a support strategy for the IPL commercial off-the-shelf hardware system.

Advanced Human Computer Interface[29]

An advanced human computer interface (AHCI) has been developed by the Collaborative Technologies Task Team (D44210). AHCI is one of the major technologies that support the Network Centric (NC) AN/UYQ-70 (Q-70) Technology Insertion Cooperative Agreement between the SPAWAR Advanced Technologies and Prototypes Division (PD-13) and the NAVSEA Program Executive Office for Expeditionary Warfare (PEO-EXW). The development and transitioning of this AHCI will lead to improved operator performance in both decision-making and situation awareness. The AHCI will also impact the future design and acquisition of the NC Q-70.

AHCI comprises the Open System Advanced Workstation (OSAW) and Display User Enhancement Technology Systems (DUETS) projects. OSAW was completed in 1999 and offers next-generation workstations for command and control systems by integrating state-of-the-art technologies. These include flat panel displays, touch screens, speech recognition, and 3-D audio localization.

The work OSAW began continues under DUETS, a program that provides common tactical pictures of the battle space in 3-D to the tactical action officer (TAO) in the combat information center (CIC). The AHCI (OSAW/DUETS) offers a cost-effective, user-centered, and mission-relevant 3-D tactical display system with multimodal human–computer interfaces.

Current workstations can easily overload the operator with visual and auditory information without providing a common tactical picture for situation awareness. The user interface is complex, there is limited user workspace, and there are procurement problems for affordability of custom designs. This AHCI offers commercial off-the shelf and government off-the-shelf solutions for development of a tactically advanced Information Technology for the 21st Century (IT-21) system. The SSC San Diego team made recommendations on what state-of-the-art hardware and software would meet IT-21 requirements. The team designed it, made it work, and developed a tool to measure the performance of the operators.

Currently, there is no tactical 3-D display system in the Navy, but 3-D display systems for tactical environments are expected in the near future. The 3-D display system needs the high-end hardware and software that are currently available in personal computers today. The team is applying the latest in 3-D graphics capabilities to improve situation awareness and facilitate decision-making in a tactical environment.

The new workstation design meets all military standards and provides a large display workspace. It is ergonomically engineered for both male and female users and adapts to either a single workstation operator or a group of users. The team studied how many display units were needed for a multitasking environment and concluded that two monitors with virtual workspaces achieved the best performance in monitoring and information transferring tasks. A virtual workspace means that two displays with software capabilities provide multiple "virtual" displays or desktops. Information can be moved between the two monitors of the virtual workspaces.

The functional requirements for effective speech technologies are continuous speech, speaker independence, and support for recognition of a large vocabulary. In general, current speech technologies are not mature enough for Navy tactical applications. However, there are potential applications in command and control using a limited vocabulary along with a systematic analysis to identify the particular functional requirements needed to support specialized modes. There is a Fleet need for a head-worn 3-D audio system in shipboard communication systems. Human beings listen to audio transmissions differently because head size and ear shapes are different. The SSC San Diego team addressed these challenges.

A task analysis was completed for DUETS at a number of Fleet locations. The feedback data determined that 3-D display systems should not replace 2D, but rather augment them. The fleet users appreciated the new systems for land terrain, underwater topography; and air/underwater environmental data. In addition, users want depiction of air corridors, weapon engagement, sensor

detection zones, and projected track location prediction with automatic alert for new or changing tracks.

Exercise Strong Angel[30]

Exercise Strong Angel was conducted in Hawaii in conjunction with the Rim of the Pacific (RIMPAC) Exercise 2000. The RIMPAC Exercise is held every other year. RIMPAC 2000 was the first humanitarian assistance/disaster relief (HA/DR) civil-military operation of its kind. It was unique in its incorporation of civilian volunteers as refugees and actors. It showcased collaborative, cooperative efforts of SSC San Diego Advanced Concepts and Engineering Division (D41), Third Fleet and its Sea-Based Battle Lab, and the Joint Medical Center. The Defense Advanced Research Projects Agency (DARPA), Office for the Coordination of Humanitarian Assistance, the United Nations High Commissioner for Refugees (UNHCR), World Food Program (WFP), the United Nations Children's Fund (UNICEF), the U.S. Marine Corps, the American Red Cross, and a host of other organizations were researchers and participants.

The exercise had several operational and experimental goals. Key among the experimental goals was the evaluation of the DARPA Translingual Information Detection, Extraction, and Summarization (TIDES) portal as a means of ascertaining critical information from local and worldwide open sources. The SSC San Diego D41 Advanced Technology Transition Program Office is the executive agent for the TIDES program, which is sponsored by the Information Technology Office at DARPA.

TIDES currently has the capability of collecting, processing, and archiving temporal, ephemeral radio and television broadcasts and other fleeting web and newspaper information. TIDES performs the speech to text conversion that enables the language understanding technologies to extract key elements such as speakers, topics, events, locations, and people.

With the continued research in machine language translation, and in summarization technologies, TIDES will provide a heretofore unprecedented capability for the military planners and intelligence personnel to determine the relevance and information in hundreds of thousands of documents, regardless of language.

Strong Angel was a civil–military exercise with a dozen United Nations (UN) representatives, about a hundred volunteer civilian refugees, Marines, and Navy all assuming the roles and significant responsibilities they would have in an actual HA/DR operation. With the sole exception that there were only 100 refugees rather than a hundred thousand, Strong Angel went well beyond the scope of a command-post exercise by placing the participants in an austere environment on the Big Island of Hawaii, planning and solving the problems faced by each.

The UN, local government representatives, and military personnel exercised the full capabilities of the Civil–Military Operations Center with meeting and collaboration tools from two other DARPA/D41 Advanced Technology

Transition Program Office research programs: Intelligent Collaboration and Visualization Program and the Information Management Program. With these tools, they ascertained their individual and combined capabilities; worked through the day-to-day command and logistics issues; and planned the transitions from military and UN to the local government. As much realism as possible was imposed by utilizing the experience and the lessons learned of UN and military personnel who have conducted actual HA/DR and other similar operations.

The UN personnel included several senior members of the UNHCR, WFP and UNICEF staffs who came from current assignments in Zimbabwe, other Third World refugee crises, and UN Headquarters in Geneva and New York.

As would real refugees, the Strong Angel volunteers, with the assistance of the UN personnel, elected leaders and formed their own community to deal with issues of crime, housing, hygiene, and unaccompanied children. Their elected leaders interfaced with the UN and military forces. They dealt with real problems such as no showers when the water pumps broke and wet cots from the rain. They dealt with exercise-induced problems when some refugees stole from other refugees and the military. There were women who gave birth, children who could not find their parents, rabble rousers, weapons, an attempted riot, and numerous exercise-based health problems that each of the participants, whether UN, military, or refugees had to deal with.

This was one of only a few times that civil and military organizations have attempted to collaborate on this scale, including the military subordinating itself to the UN. There was much to learn by each regarding the other's capabilities and priorities. Historically, when the military has been employed in these HA/DR roles they have essentially assumed command, implemented the infrastructure and logistics measures necessary to get the situation under control, and then pulled out, often taking the enabling infrastructure elements with them.

In Strong Angel, planning for the military pullout and transition was initiated at the outset. Communications and logistics elements that are used by the aid agencies were used by the military. Additionally, the UN found the technology tools for collaboration and planning invaluable, though they were initially skeptical since the tools were not a part of the way they currently operate. They have invited SSC San Diego and other DARPA researchers, as well as Third Fleet, to plan for future experiments in UN Headquarters and at field sites.

In addition to TIDES, there were experiments in solar electric power, hydrogen fuel cell power, distributed medical intelligence, collaboration and meeting support, multilingual interview tools, coalition wide-area networking, refugee registration and tracking tools, the use of multimedia research tools, and wireless networking.

The lessons learned from Strong Angel cover a number of domains, including command and control, operations planning, civil-military operations, international communications, information technology support, and logistics. The military forces discovered the diverse nature of the UN infrastructure and its

flattened, almost anarchic decision structure. They gained an appreciation for the qualifications and resources that these agencies provide to humanitarian efforts. The UN personnel had an opportunity in an exercise setting to ascertain what unique capabilities the U.S. military can provide and what those capabilities cost. Each group shared lessons they had learned from actual operations, adding substantially to the shared education in humanitarian operations.

ASCIET 2000[31]

Under sponsorship of the Advanced Tactical Data Link Systems Program Office, SPAWAR PMW-159, a field engineering team and data link test systems were developed at SSC San Diego. SSC San Diego Test and Evaluation (D4524) played important roles in the All Service Combat Identification Evaluation Team (ASCIET) 2000. This major combat identification evaluation effort involved thousands of participants. It was conducted 28 February through 10 March 2000 at Fort Stewart, Georgia by the ASCIET.

The ASCIET, located at Eglin Air Force Base, Florida is responsible for testing the equipment, methods, and engagement tactics of the four branches of the U.S. armed forces to learn how well they avoid the problem of mistaking friendly forces for the enemy. It addresses the high level of fratricide concerns brought about by the increased emphasis on joint warfare operations and the fielding of weapons and sensor systems operating beyond visual range, at night, and in adverse weather conditions.

The annual ASCIET tactical field evaluation of combat communications brings together U.S. Navy, Army, Air Force, and Marine forces; defense contractors; air, sea and ground assets; and state-of-the-art and emerging technologies. Data are collected during 10 days of mock encounters under realistic conditions between friendly (blue) and hostile (red) forces. The white force, a neutral cell, directs and monitors operations in a central control facility called Showtime. Showtime features banks of computers, communications and monitoring equipment, and large projection screens. A unique and powerful databased debrief process links participants via video teleconferencing and provides accurate feedback on what actually happened during a mission. The process develops participants' knowledge of other services' systems and capabilities and provides an opportunity to learn integrated joint operations. ASCIET ultimately recommends solutions to combat any identification deficiencies.

The British Royal Army, Navy, and Air Force also participated in the ASCIET 2000 event bringing total participation to about 6,500. Sites supporting ASCIET 2000 included the Combat Readiness Training Center and Hunter Army Airfield at Savannah, Georgia; Jacksonville Naval Air Station, Florida; Robins Air Force Base, Georgia; the Gator/Quick Thrust Military Operating Areas; and the Atlantic Surface and Air Ranges. After an initial week of setup and dry runs the two-week evaluation included 50 hours of both day and night operations.

SSC San Diego personnel and data link test equipment have participated in past ASCIET efforts. Because of the proven reliability of the systems developed here, the SSC San Diego team was invited to officially provide a Link-16 evaluation capability from the blue forces into Showtime for ASCIET 2000.

Part of the team drove a self-contained mobile unit from San Diego to Savannah. The unit, which serves as a relay station for Link-16 communications, includes a Joint Tactical Information Distribution System (JTIDS) Class 2 terminal, receiver, transmitter, personal computer (PC)-based data link test tools, antenna, and a generator trailer. Also shipped to Savannah were two JTIDS mini-racks, portable units designed and assembled at SSC San Diego to enable onsite testing of Link-16 communications.

The JTIDS relay truck and antenna were set up about 60 feet outside the building at the Combat Readiness Training Center housing Showtime. They were cabled to data link test tools, called TADIL J Host Simulators (TJHS), inside the building. Developed by the SSC San Diego Tactical Systems Integration and Interoperability Division (D45) and contractor Digital Wizards, the TJHS is a PC-based tool that can emulate a Link-16 host and has a geographic tactical situation display. It provides a real-time map of tactical surveillance information for an exercise, including precise participant location and identification symbols, tracks, and points.

A modified TJHS system was used for the evaluation that enabled the overlay of ground truth data on the link picture via the use of Time Space Position Instrumentation pods fitted on all participant aircraft. This allowed the ASCIET staff to debrief events from link data and still stand by their unofficial motto, "If it wasn't instrumented, it didn't happen."

The TJHS system displays a scrolling list of Link-16 messages and has data extraction, reduction, and replay capabilities for test recording and analysis. With these capabilities the TJHS systems at ASCIET provided not only a visual picture of Link-16 communication, but also data recording and replay. Provided also was a voice communication capability.

During ASCIET 2000, the system and technical team monitored and recorded Link-16 communications from all aircraft, ships and ground participants. Participants included: F/A-18s, F-14Ds, Airborne Warning and Control System E-3As, the Joint Surveillance and Target Attack Radar System, the Rivet Joint, Airborne Battlefield Command and Control Center, a Navy E-2C Squadron, British Tornados, F-16s, the Patriot Information Coordination Center, Aegis destroyers, the USS MITSCHER (DDG 57), HMS Norfolk, and many others. The quick playback feature of the TJHS system was utilized and appreciated by many of the participants.

In addition to the system in Showtime, the SSC San Diego field engineers set up one of the portable JTIDS mini-racks in an adjacent building near the blue force pilots' preflight room. The second system was located about 50 miles away at Fort Stewart. It was used by a team testing a developmental joint forces command multi data link translation system called Rosetta.

SSC San Diego's test tools played a critical role in the ASCIET command center in verifying tactical data for the blue forces. They were also instrumental in testing the Multifunctional Information Distribution System (MIDS) on the F/A-18Ds. This was the first time the F/A-18 MIDS Link-16 capable aircraft were participants in ASCIET. The systems performed flawlessly and provided reliable data.

As part of a technology brief at ASCIET, the data link test tools were demonstrated to U.S. Joint Forces Command, Commander in Chief Adm. Harold Gehman and U.S. Atlantic Fleet, Commander in Chief Adm. Vern Clark.

Network Centric Q-70[32]

Tasked by SPAWAR Advanced Concepts and Technologies Directorate (PD-13), two SSC San Diego technical groups provided network centric systems engineering, installation, and integration onboard the USS CORONADO (AGF-11) Sea Based Battle Lab (SBBL). The Intelligence and Information Operations Systems group, D4223, executed the initial design of the Network Centric Q-70 architecture and worked with the Q-70 team to design, integrate, and test server racks and ultra thin clients.

Once testing was completed at SSC San Diego's Network Centric Computing Facility, the install team from the office of the system engineer, Command and Control Fleet Engineering Division, D644, took delivery of the two Q-70 server racks, transported and installed them onboard CORONADO. Cabling was laid and 22 15-inch flat-panel clients and five ruggedized 18-inch flat-panel clients were delivered to the ship. Three alcatel/Xylan edge devices were also delivered to support connections for up to 60 client seats. User training was completed on March 20 and a ribbon cutting ceremony was held 17 May.

In May of 1999, SSC San Diego entered into a collaborative agreement with SPAWAR PD-13 and Naval Sea Systems Command (PMS-440). PMS-440 is the program office for the Q-70 program. The Q-70 mission is to improve, update, and innovate Navy systems using commercial off-the-shelf (COTS) products and technology.

Traditionally the Navy produced dedicated display consoles for mission-critical requirements like sonar, radar, and navigation displays. Utilizing COTS products significantly reduces cost. The average cost for a special function display console is $200,000. This ongoing technology insertion project is targeting a cost reduction goal of 50 percent as a minimum.

The Navy is moving toward a network connectivity approach versus a point-to-point connectivity approach and PD-13 solicited SSC San Diego's expertise in network centric technology. Various personnel and groups at SSC San Diego put together a proposal of what the Center could provide in a way compatible with the Information Technology for the Twenty-First Century initiatives. One aspect of that is to take what the Center has been working on in network centric computing, i.e., thin clients, high-bandwidth, high-availability

networks, and high-availability scalable servers and package those into information technology solutions.

From basic prototypes, the Center developed full configuration designs that culminated in rack configurations of server, disk arrays, networking components that PMS-440 had their prime contractor, Lockheed Martin, build.

The design and architecture of how those pieces would be used were developed through the Cooperative Research and Development Agreement with Sun Microsystems. Sun Microsystems' most recent client and server products were built into the architecture that was deployed on CORONADO. The most striking thing about the system is the ultrathin client called the Sun Ray that is integrated into standard commercial flat panels as well as ruggedized government off-the-shelf (GOTS) panels.

The clients deployed on CORONADO are small size and weight and low power flat-panel devices that serve as the console for the operators. Via the architecture developed by the Center, Windows, Unix applications, web applications, and JAVA applications can also be delivered all to the same flat panel display. The user is not tied to a physical platform or operating system for his/her actual workstation. In addition, technology refreshment problems have been addressed. Everything is running on network servers, so as the technology advances, the server boxes can be pulled out and replaced rather than updating all the client workstations.

In addition, the latest clients have a smart card integrated into the device to instantiate each session. The operator can pull the card and the display shuts down. The operator can move to another location on the ship, plug the smart card in, and the same desktop will pop up instantly. Operationally, this provides a much more fault-tolerant end device because if a particular device loses power, burns out, or malfunctions, the operator can pull the card out and move to another available node to continue working. Everything is still running on the servers. From a field replaceable standpoint, it is an appliance like a telephone handset. The user can unplug four or five cables, plug in a replacement device, turn the power on, and be exactly where he/she was before the failure.

Total cost of ownership is greatly reduced because administration costs of each workstation are zero. There is nothing to load or configure. To get the cost down further, SSC San Diego is continuing to consolidate the servers and make the administration simpler. As the server packaging is condensed, the installation costs go down because in a shipboard environment they are tied directly to the number of racks you have to put in place. Administration then becomes strictly tied to the servers and the networks. Near-term efforts will be to simplify the administration process of the servers and achieve a high-availability, very simple, low-cost system suited to keeping up with technology.

Link-16 Joint Range Extension[33]

SSC San Diego successfully demonstrated the Link-16 Joint Range Extension (JRE), a solution to Link-16 line-of-sight limitation, to Maj. Gen. Peter

Franklin, Deputy Director of the Ballistic Missile Defense Organization (BMDO) during his visit to SSC San Diego's Link-16 Test Control Center (TCC), located in the Systems Integration Facility (SIF).

The JRE program began with BMDO selecting the Joint Tactical Information Distribution System (JTIDS) and the Tactical Digital Information Link-J (TADIL-J), also known as Link-16, as the primary terrestrial data link in support of theater missile defense (TMD). Subsequent to that decision, BMDO and the services developed a new set of TADIL-J messages to support TMD communication requirements via JTIDS. The current method for extending the range of a JTIDS network beyond line-of-site is to employ airborne assets as relays between zones. This allows deployment of a very large (geographically), integrated JTIDS network that provides interconnectivity between all the elements in a theater. However, use of airborne relays is wasteful of theater assets and consumes network capacity that could be used for reporting additional information. The JRE concept is to use satellite communications (SATCOM) and terrestrial communication interfaces (phone lines) instead of airborne relays to pass TADIL-J messages from one JTIDS zone to another.

The Link-16 Test Control Center (TCC) was selected as the site for the demonstration because of the significant amount of hardware in-the-loop that SSC San Diego is capable of providing. A variety of C^4I systems can be remotely operated and/or monitored from within the TCC. These systems include Common Data Link Management System, Air Defense Systems Integrator, Multi-TADIL Capability, Advanced Combat Direction System Block 0/1, and any one of the family of Navy gateway data link test tools (DLTT).

The resources included Pedro Tower, the SIF, and the Combat Direction Systems Development and Evaluation Site. The scripted scenario used in the demonstration was geographically situated on the Korean peninsula. SSC San Diego provided all the tactical systems necessary to provide a virtual carrier battle group (CVBG) operating off the coast of South Korea in the Sea of Japan. The JRE Application Annex A (JREAP A) token-passing protocol provided connectivity between the CVBG and the JRE gateway located in the TCC. JREAP A is a joint implementation of the Navy Satellite TADIL-J (STJ) protocol. JREAP A improves upon the legacy STJ protocol currently implemented in a number of Navy ships and submarines. Two additional JRE protocols are currently being developed. These new protocols will provide point-to-point and Internet Protocol (IP) connectivity. The scripted JRE gateway location was at the Hardened Tactical Air Control Center (HTACC) at Osan Air Force Base, Republic of Korea.

Using the JREAP A token-passing protocol over a live UHF SATCOM Demand-Assigned Multi-Access system circuit, a two-way ship-shore/shore-ship interface was established. Approximately 250 tracks were exchanged between the CVBG and the HTACC JRE gateway. The HTACC JRE gateway established two additional serial interfaces. One interface was between the Marine Corps Tactical Systems Support Activity, Camp Pendleton, California, and the other was to the System Engineering and Development site at Huntsville, Alabama.

The real-time exchange of tracks provided Major Gen. Franklin an opportunity to see how JRE solves the JTIDS line-of-sight limitation. The in-depth track filtering capability demonstrated how JRE could be used to limit less significant Link-16 track data when media bandwidth is at a premium. Following the successful demonstration he expressed his appreciation for the work accomplished by each of the services in support of this joint program and stated that JRE is essential for the warfighter. He explained that the services are working very hard to develop and improve systems to counter the theater ballistic missile threat. JRE is a complementary effort that will ensure Link-16 tactical data is available anywhere it is needed, anyplace in the world.

Fleet Engineering Department (D60)

Design War Room[34]

In August 2000, SSC San Diego held a ribbon-cutting ceremony with SPAWAR and Naval Sea Systems Command (NAVSEA) to celebrate the opening of the new Design War Room for Integrated Installations.

The Design War Room is located at Old Town Campus in Building OT2. It is a 20,000-square-foot area created by direction of CAPT Ernest L. Valdes to co-locate key organizations involved in the design, planning, and execution of shipboard integrated installations. Bob Buckley, head of the Design and Support Division (SPAWAR 04R-3), was one of the key visionaries as were other technical experts from SPAWAR and SSC San Diego. Concepts were also provided by representatives from the planning yards and industry partners who actually perform the designs, design reviews, and shipboard installations.

By co-locating the key players in design and documentation, process issues and difficulties can be resolved early and before they develop into major problems. Bob Buckley wanted to co-locate various design agencies but did not have a place or the staff to accomplish this. CAPT Ernest L. Valdes recognized that the various stakeholders in the installations, such as the Navy technical representatives and the industry partners, needed a central place to come together. To support these visions, SSC San Diego D60 and D30 worked together to relocate existing personnel to create a large area in OT2 dedicated to the installation design and planning effort.

The designated area is divided into open, spacious areas providing each of the four battle groups a separate war room. There is a large integrated installation team war room for the ship superintendents. The SPAWAR Design Support Center has filled their portion with class desks, planning yard representatives, and representatives from the Naval Surface Warfare Center, Port Hueneme, and Naval Air Warfare Center Aircraft Division.

Many installation problems can be traced to design issues. In some cases, the installations are not sufficiently detailed in drawings and in other cases, the industry partner installers do not understand the drawings. Sometimes drawings arrive too late for advanced planning or there are changes late in the design. The goal is to get the designs done early, with a target of 120 days, before starting the installations. All of the parties will then have time to review the drawings, buy any long lead-time materials required, and address issues and questions. The installers can check the drawings to see if any issues have been overlooked in the drawing development or challenged from an installation planning point of view.

Joint Computer-Aided Acquisition and Logistic Support[35]

The U.S. Department of Defense (DoD) demands rapid and accurate accesses to engineering and logistics support data, especially in times of war. Even the most brilliantly orchestrated sea, ground, or air campaign can be jeopardized if warfighters lack information about a system's operation, parts availability, combat readiness, and maintenance support. Joint Computer-Aided Acquisition and Logistic Support (JCALS), deployed at SSC San Diego in 2000, is a joint service program that automates the way the government receives, manages, and uses weapons systems information. The Systems Support Engineering Division (D65) is developing an inventory tracking system to support the Navy total asset visibility using JCALS infrastructure.

In 1984, a joint DoD and industry task force performed a study of new and emerging computer technology related to the logistic support process. The task force defined goals to design more supportable technical information, acquire, and distribute weapon systems logistic and technical information in digital form. In September 1985 the Deputy Under Secretary of Defense approved a strategy to transition from paper-intensive weapons systems support to an automated and integrated operational mode.

The Army's Technical Information Management System was used as the basis for the Army Computer-Aided Acquisition and Logistic Support (ACALS) program. In May 1988, the Office of the Secretary of Defense approved an acquisition strategy for ACALS. The request for proposal for the Computer-Aided Acquisition and Logistic Support (CALS) architecture was released. The Army was directed to include joint requirements and provide the design, development, acquisition, and implementation options for a joint program. The DoD joint services and the Defense Logistics Agency initiated JCALS. As the JCALS prime contractor, Computer Sciences Corporation (CSC) introduced state-of-the-art digital and information systems to help the DoD design, select, and purchase hundreds of thousands of parts needed for today's weapons systems.

In June 1992, the JCALS project manager was directed to proceed into development with a system that included only jointly agreed to connectivity, data management, and technical manual functionality. It was agreed that other joint functional requirements would be defined, validated, and implemented in JCALS as the system evolved.

SSC San Diego started investigating JCALS in late 1997 when Internet and World Wide Web technology became more and more influent to DoD business. An initial agreement was established to ensure that SPAWAR JCALS was accessible from personal computer (PC) thin clients as well as its original PC thick client version. A Memorandum of Agreement (MOA) was signed to deploy a JCALS system in late 1999. Trang Vo, Advanced Test Engineering Technology Branch (D652), was assigned as the general system administrator. Currently, D652 is training users utilizing the work flow manager. Code D65 is developing a command-wide inventory management system that will be

integrated with JCALS. The system, called the Supply Information Management System (SIMS), is using JCALS as the infrastructure.

Access to SSC San Diego JCALS is enabled for both thick and thin PC clients. As a thin PC client, a user only needs a web browser to log in on one of two web servers (Quad 400-megahertz NT server). Interface between the web servers and the database server (DEC Alpha 4100) will determine if the request is handled locally or remotely using information from other sites. If the request cannot be handled locally it is packed with other referenced information and sent to the appropriate site through encrypted communication lines. The work flow manager provides a handy tool to support project management. The technical manual provides publishing capability. The engineering drawing retrieves technical information across DoD facilities.

Based on open systems, distributed architecture that uses client-server and object-oriented technologies, JCALS links geographically dispersed disparate automated systems at military sites across the United States. A combination of local and wide area network connections lets users access, move, and process data stored in other systems regardless of data format, location, or time of day. JCALS enables the DoD to build, maintain, and support weapons more efficiently. By capturing and storing weapons systems information on an integrated database, JCALS improves the quality of systems. It cuts costs, speeds production, and eliminates the duplication of data common among stand-alone systems. With built-in design hooks to incorporate new standards, JCALS can meet the needs of the user community now and in the years to come.

Thirty-two JCALS sites have been deployed (as of March 2000) within the DoD across the continental United States to support many programs. The integration of the JCALS products within DoD, military services, and the Defense Logistics Agency functional process established a seamless integrated data environment.

SPAWAR C^{4}ISR Institute[36]

The SPAWAR Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance Institute (C^{4}ISR) opened in CY 2000. Through integrated, end-to-end system knowledge, assets, coordination, and technical expertise, the institute provides immediate training solutions to the fleet.

The institute presented the first Grey Beard Training Forum on 13 to 14 June at the SPAWAR C^{4}ISR Institute Training Center, located in Old Town Center Campus, Building 1. The forums are intended to provide direct interaction with fleet personnel to answer their questions and problems regarding SSC San Diego C^{4}ISR systems.

The forums were developed in concert with SSC San Diego and SPAWAR Headquarters training initiatives. Utilizing system experts to establish the training base, the Institute put together an agenda that included an overview, technical tips, troubleshooting, and frequently asked questions. It included recent advisories to address the following systems: Automated Digital

Network System, International Maritime Satellite, ultrahigh frequency to 5 kHz, Integrated Shipboard Network Systems, Global Command and Control System-Maritime, XYLAN Switch, and Network Terminal/Exchange.

The SPAWAR C^{4}ISR Institute is focused with "help the fleet first" objectives. It provides support in system training and coordination; collaboration with all program offices to provide a single point of contact for training concerns and questions; provide integrated, end-to-end documentation; and offer train-the-trainers curriculum and on-the-job training standardization. It is a West Coast Training Center of Excellence (TCOE) facility. It also supports the Chief of Naval Education and Training (CNET) through Local Training Authority, Integrated Battle Force Training, training plans, transition plans, configuration management and Navy Training Systems Plan support.

The goal is for future C^{4}ISR training to be coordinated at the institute through a collaborative effort with CNET, Amphibious Task Group, Fleet Training Center and Fleet Combat Training Center Pacific. This effort will accomplish the training needed to keep the fleet current with SSC San Diego C^{4}ISR systems and the rapid refresh rate at which systems change. The SPAWAR Institute's approach will assure that through integrated end-to-end system knowledge, coordination, and technical expertise SSC San Diego will provide immediate training solutions to the fleet. The fleet sailor will be ready to address any future system administration, operation, or maintenance problems.

Integrated Installation Teams

Please see article in "Space and Naval Warfare Systems Activity, Hawaii (D90)."

Intelligence, Surveillance, and Reconnaissance Department (D70)

Radio Direction Finding Prototype[37]

On 10 August 2000, personnel from SSC San Diego used a prototype system developed by the Center for the U.S. Coast Guard (USCG) to help save the life of a lost boater. A boater, alone in her 24-foot cuddy cabin, became lost in the early morning fog, disoriented, and ill so she called the Coast Guard for assistance. With her position pinpointed by the SSC San Diego Radio Direction Finding (RDF) demonstration system, a Coast Guard helicopter rescued her and flew her to safety.

The search and rescue (SAR) event began when the Coast Guard received a distress call from a woman who was adrift with no land in sight. Using their operational sensors and established SAR procedures, the Coast Guard helicopter searched the open ocean off Mission Beach (San Diego) for 4 hours but failed to locate her. Then, remembering the successful demonstration of RDF technology that a joint SSC San Diego and Coast Guard team had completed in July 2000, the SAR controller on duty at USCG Activities San Diego called SSC San Diego for assistance. Using the technology demo system, a team from Signal Exploitation and Information Management Division (D72) and Joint and National Systems Division (D73) was able to quickly determine that the boat was located near Ensenada, Mexico, not San Diego. Within minutes, the Coast Guard helicopter crew rescued the 22-year-old woman. She was transported to the hospital and treated for hypothermia, then later released.

The SSC San Diego developed RDF demonstration system calculates line of bearing from four shore sites at Point Loma, San Clemente Island, Otay Mountain, and Camp Pendleton to the caller's transmitter and performs a cross fix to estimate the caller's location. With real-time and playback (post-facto) mode, data is available quickly and accurately.

The successful involvement of SSC San Diego in the SAR effort was reported on the local news and briefed to the Commandant of the Coast Guard.

Communications and Information Systems Department (D80)

Supplemental Weather Radar (SWR) AN/FPS-131[38]

A ribbon-cutting ceremony was held 8 November 2000, for the Supplemental Weather Radar (SWR) AN/FPS-131 installation at SSC San Diego Seaside Building 599. This was a coast-to-coast teaming effort to provide real-time weather surveillance. The Enterprise Electronics Corporation installed the system under contract to SSC Charleston, Meteorology and Oceanography Systems Branch. Funding was provided by SPAWAR Program Manager Meteorology and Oceanography (METOC) Systems (PMW-155). The radar will be operated and maintained by the SSC San Diego Atmospheric Propagation Branch (D858).

The SWR provides detection, warning, and surveillance of severe weather phenomena. This is a state-of-the-art Doppler radar capable of providing real-time surveillance and advanced warning of potentially severe weather fronts. The radar operating frequency is 5575 MHz and will be directing its radiation seaward. The SWR is of interest to D858 because of its ability to gather data on sea clutter return under varying ducting conditions. One ducting mechanism, the evaporation duct, is a common phenomenon over the ocean. This type of duct is due to the variation of the refractive structure in the first few tens of meters above the surface of the ocean. The evaporation duct affects propagation at frequencies of 2 GHz and above and can be characterized by a height.

SSC San Diego demonstrated that evaporation duct heights could be inferred from radar clutter returns using data from the Space Range Radar at Wallops Island, Virginia. Using data from USS O'KANE (DDG 77) and USS NORMANDY (CG 60), it was demonstrated the technique would work for AN/SPY-1 radar in wind speeds of 3 meters per second or greater. The SWR may provide additional insight to and validation of the techniques, particularly with the availability of high-quality meteorology and oceanography METOC observations from the Office of Naval Research/Scripps Institution of Oceanography, Point La Jolla buoy.

Another ducting phenomenon, and the one that is of the greatest interest to operational forces, is the surface-based duct that is common in the summer in climates like southern California and the Mediterranean, and during much of the year in the Persian Gulf. This type of duct leads to dramatic effects including errors in target heights for 3-D radars, the ability to detect surface targets or low-flyers at distances of 100 kilometers (km) or more beyond line-of-sight range, and holes in the radar's coverage above the duct. When a surface-based duct is present, it is expected that the SWR will receive land clutter returns from San Clemente and Santa Catalina Islands and the Los Angeles coastal areas as well as sea clutter returns at over 100 km.

SSC San Diego has undertaken a modeling effort to explore various techniques for obtaining refractivity from land clutter, while efforts to exploit sea clutter to the same end are underway at Duke University and at the Scripps Institution of Oceanography. Through-sensor determination of surface-based duct parameters has many similarities to acoustic matched-field processing and the existing database to support that work is small. Data from the SWR will aid these efforts. The ultimate objective of this work is to provide a rapid environmental assessment capability for fleet radars.

Mast-Clamp Current Probe (MCCP)[39]

A new antenna to replace existing shipboard high-frequency (HF) receive antennas was designed, manufactured, installed, and successfully tested on several ships. The mast-clamp current probe (MCCP) antenna is a ferrite-core current probe device designed to couple to existing ship structures, especially the mast, to form an antenna to receive radio frequencies (RF) in the HF (2-30 MHz) frequency range.

The MCCP consists of two half-sections connected together around the mast. The present HF communication antenna complement on a typical Navy ship takes up a significant amount of space. Some of the antennas, such as tiltable single or twin receive whips with the associated tilt mechanisms, have become expensive to maintain. In addition, the recent requirements to reduce radar cross section (RCS) have become an antenna design issue. The current probe antenna offers a means to reduce the present number of HF receive antennas by using parts of the ship's superstructure as the receive antenna and coupling to it with a current probe. The elimination of existing antennas also results in a reduction of RCS.

The MCCP antenna was originally developed to solve high-maintenance problems with twin receive whip antennas and tilt mechanisms on destroyer (DD 963) class ships. The MCCP was successfully demonstrated aboard USS OLDENDORF (DD 972) in 1996. MCCP antennas were designed for guided missile destroyer (DDG 51) Flight I and II ships to replace the high-maintenance, 14-foot twin receive whip antenna and tilt mechanism. MCCP antennas have been installed and tested on USS MILIUS (DDG 6), a Flight I ship, and on USS MCFAUL (DDG 74), a Flight II ship. Other ships for which MCCP antennas have been designed, installed, and tested are USS CORONADO (AGF 11), USS PEARL HARBOR (LSD 52), and USS BON HOMME RICHARD (LHD 6). These ships all have wideband communication systems that place additional design constraints on the MCCP receive antenna. Nonetheless, in all cases, the MCCP had performance comparable to that of existing receive antennas.

In the design process, it is necessary to perform a trade-off between antenna sensitivity and system isolation. The current probe loss must be small enough so that the antenna can meet minimum sensitivity requirements, yet be large enough to provide sufficient isolation between the probe antenna and the HF transmit antennas.

The use of 48th scale brass ship model measurement techniques is essential to this process since that is the only way to determine the isolation and to determine the feasibility of using a selected portion of the shipboard superstructure as an antenna. The design process involves choosing a feasible location for the MCCP, usually the stub mast portion of the mast superstructure. This portion of the 1/48th-scale brass model is then fed as an antenna and impedance measurements are then made on the modeled antenna. After the impedance measurements are completed, isolation measurements are made between the modeled antenna and the modeled HF transmit antennas. This isolation data is used to determine the loss characteristics of the MCCP necessary to avoid electromagnetic compatibility problems. The isolation data and the impedance data are used to conduct the trade-off study between antenna sensitivity and system isolation. Once the trade-off study is completed, the design parameters of the MCCP can be determined.

The 1/48th-scale brass model is then placed on the antenna pattern measurement range and the radiation pattern characteristics of the modeled MCCP antenna are obtained. These patterns are judged on the basis of omnidirectionality and comparison with the HF antenna to be replaced by the MCCP. The current probe antenna design is specific to a particular ship and its location on the ship. This has resulted in a variety of probes having different electrical characteristics, as well as different apertures, or size. Fischer Custom Communications, Incorporated, who are experienced in producing many types of current probes produced the MCCP current probes for each ship. Fischer was able to achieve the production of probes that match the loss versus frequency characteristics specified by SSC San Diego very closely. Shipboard testing and evaluation was performed by SSC San Diego and Eldyne, Incorporated personnel. These shipboard tests have verified that the design process used on the 1/48th-scale brass model is accurate in predicting performance on the actual ship. MCCP demonstrations are ongoing on various ships. The goal is that the MCCP will be accepted as a standard antenna replacement for HF receive whip antennas and tilt mechanisms, and permanently incorporated into the fleet.

In FY 00, SSC San Diego scheduled new ship inline installation for DDG 51 Flt-IIA class ships (91 and up). MCCP demonstrations were scheduled for the DDG 74, AGF 11, LSD 52, LHD 6, DDG 80, and AS-4542/URC-AS-4543/URC.

Virtual Reality Technical Data System (VRTDS)[40]

SSC San Diego is developing Virtual Reality Technical Data System (VRTDS) for the Next Generation Q-70 program. SPAWAR Advanced Concepts and Technologies (PD-13) tasked the work for Naval Sea Systems Command (PMS-440). The Q-70 mission is to enhance the capability of this standard Navy ship computer with network-centric features such as thin client peripherals and distributed communications.

Experience from the Advanced Interface for Tactical Security (AITS) project, developed under sponsorship of the Defense Threat Reduction Agency, is

being applied to VRTDS. The AITS project blended a variety of technologies to provide man-on-the-move distributed information and communications support for soldiers and Marines in the field. VRTDS integrates wearable computers and advanced visualization displays with wireless communications technologies generated by another project, the Demonstrator of Advanced Wireless Networks Project (DAWN), intended to provide mobile, distributed data access to the soldier or sailor wherever they are operating.

VRTDS is a direct extension of the AITS program with new applications and user communities. VRTDS is designed to provide maintenance support to shipboard personnel at their work site through the use of electronic manuals carried within the wearable computer hard drive or from Q-70 data repositories. They can also provide support through live consultations with remote technical experts using wireless voice and data communications. VRTDS will be able to present text and image data, including sequential guidance through troubleshooting procedures, and augmented reality displays such as diagram overlays and parts identification labels.

The idea is to present task support to the user wherever they may be. The user can have a computer program or a live expert guide them through a repair process. If voice and text information will not do the job, a small digital camera can be used to exchange direct video images of equipment behavior and maintenance actions between the work site and the remote expert. The goal is to reduce the need for retaining many levels of maintenance capability in crew complements or for transferring field representatives out to deployed ships to handle equipment casualties.

Wireless communications infrastructure is essential to both AITS and VRTDS. Technologies provided through the DAWN project are the "glue" that holds both programs together. Most computers, some cell phones, and some PDAs (personal digital assistants) can be accessed using their Internet protocol (IP) address. By dialing this address, data can be received or delivered to the remote device, and conversations can be held with remote users via their phones or computer speakers. This means that any hardware with an IP address is a potential communications node.

Additionally, a wireless bridge to the wired backbone can provide network redundancy ensuring a connection to valuable data even if the physical cabling were severed. Likewise, if additional network drops are needed in a location, the wireless extension can fill the void. A wireless local area network (LAN) will be installed on the USS CORONADO (AGF 11) to test out many of these communications concepts as well as provide a platform to test security and electromagnetic interference issues. Other application areas projected for shipboard use of VRTDS include emergency response, telemedicine, and command and control.

Wireless communications can be used to get multimedia information from a ship casualty directly back to damage control coordinators and tighten up the feedback loop for responding to emergencies. The use of wireless data, voice, and image links also enables distributed support for emergency medical procedures wherever they occur. These concepts have already been applied to

telemedicine in other programs. The VRTDS project is simply enhancing some of the tools. The project team is also looking at VRTDS as a method for providing command and control displays to users as they move about. Freeing warfighters from a fixed workstation or command center offers tactical value in some ship- and shore-based settings.

Submarine Low Frequency/Very Low Frequency Receiver (SLVR)

The Submarine Low Frequency/Very Low Frequency Receiver (SLVR) will replace all submarine VLF Receivers. SLVR provides significant reductions in weight, size, and power consumption. FY 00 accomplishments included the following: Completed SLVR Release 2.0 testing; delivered the final signed Type-Zero SLVR package.

Base Level Information Infrastructure (BLII)

The focus of BLII is to design and install a base communication infrastructure and pier-side infrastructure with Secure/Secret Internet Protocol Router Network (SIPRNET), Unclassified by Sensitive Internet Protocol Router Network (NIPRNET), and Joint Worldwide Intelligence Communications System (JWICS) connectivity for several naval facilities including West Coast and East Coast areas. FY 00 accomplishments included the following: Upgraded the base infrastructure for Pacific Northwest Lemoor, CA; completed pierside infrastructures for PACNOR West, San Diego, and Japan.

Digital Modular Radio (DMR) Advanced Distribution System-Maritime (ARDS-M)

DMR is a multi-mode, multi-channel, software-defined radio that tunes from 2 to 2000 MHz continuously. ARDS-M is an automated RF Distribution System. FY 00 accomplishments included the following: developed and performed down-select testing on DMR; provided technical support to Motorola and PMW-179; made preparations for OPEVAL for DMR.

Joint UHF MILSATCOM Network Integrated (JMINI) Control System

JMINI provides dynamic centralized control and decentralized management of voice and data communications operating over non-processed 5-kHz and 25-kHz Ultra-High Frequency (UHF) MILSATCOM channels to JCS-validated users. FY 00 accomplishments included the following: On 1 July 00, RADM Gauss (COMSPAWAR) signed the JMINI Control System Initial Operational Capability Interim Approval to Operate for a six-month period extending from 1 July to 31 December 00. The JMINI Control System Technical Evaluation was successfully conducted at Naval Computer and Telecommunications Area Master Stations Atlantic and Pacific from 31 July to 18 August.

Automated Digital Network System (ADNS)

ADNS is the primary tactical network for communications among ships at sea and from ship to shore. Its mission is to provide seamless and secure connectivity for voice, video and data applications afloat and pierside. FY 00 accomplishments included the following: Completed the architecture design for the ADNS cryptos (TACLANE); specified and selected the next-generation ADNS router.

Voice Over Internet Protocol (VoIP) Demonstration

The VoIP demonstration objective was to provide coalition interoperability communication in the next Joint Warrior Interoperability Demonstration (JWID). JWID 00 operational objectives included tailoring commercial off-the-shelf (COTS) equipment to demonstrate a secure coalition Internet Protocol (IP) network. FY 00 accomplishments included the following: demonstrated quality-of-service mechanisms using COTS equipment in JWID 00; voice, data, and collaborative applications were shared simultaneously among the U.S., Australian, and New Zealand nodes.

Information Screening and Delivery Subsystem (ISDS)

ISDS is the first Internet Protocol multicast system (with reliability) under Emissions Control (EMCON) to the operational submarines. ISDS will replace the Submarine/Satellite Information Exchange System (SSIXS) in the IXS Transition Plan. In September 00, SSC San Diego tested and delivered ISDS V2.0.

Advanced Refractive Effects Prediction System (AREPS)

AREPS provides an operational and research capability to assess electromagnetic system performance over water, across coastlines, and over varying terrain, including range-dependent refractive effects, for land-based, sea-based, and airborne systems. In FY 00, SSC San Diego completed AREPS version 2.1 including automode capability, area coverage display, and airborne surface-search display.

Refractivity from Clutter (RFC)

RFC is an effort to exploit emerging technology to obtain a description of the atmosphere's refractive state using radar-observed sea and land clutter. FY 00 accomplishments included the following: Demonstrated efficacy of RFC for evaporation ducts using data from USS O'KANE (DDG 77) and USS NORMANDY (CG 60); teamed with Scripps Institution of Oceanography and Duke University to install equipment that will provide data for development and test of RFC algorithms.

Advanced Enclosed Mast/Sensor System (AEM/S)

AEM/S System is a revolutionary advancement in the topside design of Navy ships. The AEM/S System will provide Navy ships with affordable radar-signature control and improved shipboard antenna-system performance through the use of advanced-composite materials with imbedded-frequency selective surface layers. In FY 00, SSC San Diego successfully transitioned AEM/S technology to the LPD-17 program.

Telesonar

Telesonar is a digital acoustic communications network designed to enable a net-centric undersea battlespace. Features include a ship/submarine/unmanned undersea vehicle/offboard communications Internet gateway, low-probability-of-Intercept mode/Distributed surveillance, and robust and channel-tolerant communications. FY 00 accomplishments included the following: Implemented a third-generation Telesonar modem; demonstrated an E-mail link to a submerged submarine.

Ultra-Lightweight Ocean Technology

The objective of this effort is to develop lightweight ocean surveillance and sensing technology with these characteristics: inexpensive; rapidly and covertly deployable; capable of autonomous operation; and compatible with horizontal and vertical bottom arrays, and horizontal and vertical large-aperture drifting arrays. FY 00 accomplishments included the following: Designed and constructed Hydra, Kelp, and ADLA arrays; demonstrated the developed technologies as part of the international RDS-3 experiment.

Advanced Communications Management System (ACMS)

ACMS provides the joint services with a complete, integrated MILSTAR satellite communications planning capability. FY 00 accomplishments included the following: Delivered ACMS Build 1; field tested joint implementations of ACMS Build 1.

Virtual Radar Targets/Universal Radar Moving Target Transponder (URMTT)

URMTT provides realistic over-the-air radar targets. URMTT can detect four targets on four different radars; put targets on 23 different radar types; and is applicable to land, ship, and airborne radars. URMTT is designed and built in-house and is the only known system with this capability. FY 00 accomplishments included the following: Made Foreign Military Sales of a system consisting of four target and four radar URMTT; received orders from the Air Force and Army for URMTTs systems.

Extending the Littoral Battlespace (ELB)

The Office of Naval Research ELB Advanced Concept Technology Demonstration accomplished three major milestones, enroute to its final Major Systems Demo 2 to coincide with Kernel Blitz in June of 01. In April 2000, ELB participated in the Marine Corps Warfighting Laboratory's Capable Warrior Limited Objective Experiment #6 in Twenty-nine Palms, CA. In June 2000, ELB conducted its Full Systems Test #1 at Camp Pendleton, CA, and El Centro, CA. In August/September 2000, ELB, in conjunction with the Marine Corps Warfighting Laboratory, conducted ELB Full Systems Test #2 and the Millennium Dragon Exercise, using Marines from Second Marine Expeditionary Force from Camp LeJeune, NC. This was conducted in various locations in Mississippi, centered out of Air National Guard Center in Gulfport, MS.

Space and Naval Warfare Systems Activity, Hawaii (D90)

In 2000, SPAWAR Systems Activity Pacific (SPAWARSYSACT PAC) continued to provide electronics materiel and information technology support, planning, installation design, installation, maintenance engineering, training, technical guidance and assistance. General support included:

- Communications, including long haul, terrestrial, RF, and satellite communications.
- System integration and networks, including local area networks and base-area networks, such as Oahu Base Area Network (OBAN), Base Level Information Infrastructure (BLII), and Defense Messaging System (DMS).
- Command and intelligence, including voice, video and data command, control and intelligence (C^2I) systems engineering and installation at ashore command centers.
- Fleet support, including systems related to ships such as Automated Digital Networking System (ADNS), exterior communications, Integrated Shipboard Network Systems (ISNS), and command and control applications.
- Information warfare, surveillance, and reconnaissance, including information warfare, surveillance and reconnaissance systems in technical areas such as information security (INFOSEC), Circularly Disposed Antenna Array (CDAA), Intrusion Detection System (IDS), and electromagnetic interference (EMI).
- Information Technology, including a variety of technology implementation and integration.

Integrated Installation Teams[41]

On 29 November 2000, an appreciation/recognition ceremony was held with SSC San Diego Commanding Officer CAPT Ernest Valdes and Executive Director Dr. Bob Kolb. They presented awards to recognize the past 15 months of successful work in planning and executing over 1,215 afloat installations (and Year 2000 upgrades) for five battle forces including USS ABRAHAM LINCOLN (CVN 72)/USS TARAWA (LHA 1), USS CONSTELLATION (CV 64)/USS BOXER (LHD 4), USS KITTY HAWK (CV 63)/USS ESSEX (LHD 2), USS CARL VINSON (CVN 70)/USS PELELIU (LHA 5), and USS JOHN C. STENNIS/USS BON HOMME RICHARD (LHD 6).

SPAWAR Chief Engineer (05) Rear Adm. (Sel) Mike Sharp delivered opening comments and explained how important everyone's efforts are in this time of radical changes in the way installations are conducted. The awards recognized that the job of providing capability to the warfighters is getting done.

The awards were concentrated on personnel in the Fleet Engineering Department (D60) and SPAWAR Systems Activity Pacific (D90), but also included

some ship superintendents in the Communications and Information Systems Department (D80). There were nine types of certificates presented for five separate battle force Integrated Installation Teams plus an award for personnel who have provided administrative support to all of the teams. Another small core group included unassigned ships and submarines.

USCINCPAC Command Center

SSC San Diego personnel integrated a state-of-the-art 27-cube video wall into the USCINCPAC Command Center. The video wall is composed of 40" cubes in a 3x9 matrix configuration, driven by three IMTECH Ultra Max processors. This video wall was integrated into the Command Center's existing audio/visual system via a 16x16 Autopatch switch matrix. It provides the Command Center with the optimal solution for presenting briefs, high-resolution maps, and other information at a larger scale than previously available. It also increases the number of simultaneous high-resolution displays available in the Command Center. The video wall is the focus of the Crisis Action Team component of the Joint Operations Center of Command Center. This technology insertion was accomplished as part of the Command Center Improvement Program tasking.

Oahu Base Area Network (OBAN)[42]

The Oahu Base Area Network (OBAN) is the supporting network for six naval commands in the Pearl Harbor, Hawaii area. OBAN is a project initiated in 1998 by the then Commander in Chief, U.S. Pacific Fleet (CINCPACFLT) Adm. Archie Clemins. It provides desktop connectivity to the staffs of CINCPACFLT; Commander, Submarine Force, U.S. Pacific Fleet; Commander, Navy Region Hawaii; Commander, Navy Surface Group Middle Pacific; Naval Magazine Pearl Harbor; and Navy Reserve Center Honolulu. Over 2,200 unclassified and 1,100 classified workstations are networked over 12 square miles via multiple Optical Carrier 12 (OC12) 622 Mbs/sec backbone links, and OC3 (155 Mbs) connections to the desktop.

OBAN has the distinction of being the Navy's first large Asynchronous Transfer Mode (ATM) to-the-desktop network. It serves as the model for other Pacific Fleet regional Base Area Networks in Japan, San Diego, and the Pacific Northwest.

Hawaii-based SSC San Diego personnel are part of the team of civil service and contractor professionals that designed, implemented, and currently manage OBAN. They provided cable plant and computer room design and installation, network architecture, remote access and Virtual Private Network implementation, network monitoring and management, and the integration of commercial/government off-the-shelf software (COTS/GOTS) into the standard OBAN workstation. For their efforts, they were recognized with cash awards by Director for Command, Control, Communications, Computers, and Intelligence, Commander in Chief, U.S. Pacific Fleet CAPT James Fordice.

Integrated Shipboard Network System (ISNS) Local Area Network (LAN)[43]

SPAWAR Systems Activity Pacific, Fleet Support Sector completed an Integrated Shipboard Network System (ISNS) local area network (LAN) onboard the USS PAUL HAMILTON (DDG 60). Recognizing the need to give PAUL HAMILTON, USS FLETCHER (DD 992), and USS CROMMELIN (FFG 37) temporary SIPRNET (Secret Internet Protocol Router Network) connectivity for their fleet training exercises, a temporary LAN was proposed and tasked. SSC San Diego personnel engineered, managed, coordinated and took part in the installations to ensure that the systems were operational. The temporary LANs were completely successful, giving the ship NIPRNET and SIPRNET connectivity as well as much needed training on the new C^4I alterations. The LANs provided the ships full capabilities, including interfaces to Joint Maritime Command Information System (JMCIS) 98 and Naval Tactical Command Support System (NTCSS) Increment 1 Optimized systems.

Appendix A: 2000 Achievement Awards

JOINT AWARDS

Joint Meritorious Civilian Service Award

Bob Kolesar, for service as science and technical advisor for the Requirements and Acquisition Division for the Joint Chiefs of Staff, including work on the Defense Science and Technology Strategy

NAVY AWARDS

Navy Meritorious Civilian Service Award

Raymond Barrera, for service as Horizontal Integration (HI) test director for the SPAWAR System Integration/Test and the Year 2000 Office, including coordinating efforts with SPAWAR, SSC San Diego and SSC Charleston in preparation for the January 2001 HI end-to-end test

Vivian DiCristofaro, for supervising the National Imagery and Mapping Agency Support Office, C4I Programs Office, Philadelphia, including managing the Image Product Library program for storage, catalog and dissemination of imagery and image products

Bart Everett, for direction of the Mobile Detection Assessment and Response System (MDARS) program through intensive and successful development and testing, resulting in SSC San Diego's selection as MDARS technical developer

David Forbes. As a charter member of the Center's Business Development Board, he helped define the Business Development Plan and process for developing cross-department teams to address new business areas

Jack Gerrard, manager of the Global Command and Control System—Maritime Ashore project, which between January 1998 and January 2000 was fielded at 26 Navy command centers around the world

Chew Hom made the major contribution to the development and deployment of the Command and Control Processor, analyzing the simulation system and implenting design and software changes that allowed the program to continue without additional schedule impact

Elissa Huffstetler, program manager for the Tactical Receive Equipment Program, coordinating system engineering upgrades with the joint services, the intelligence community, third party countries and end users

Dennis Hurst, for management of the Hayfield Project, a state-of-the-art development of a miniaturized and programmable cryptographic device. He served as a critical member of the Center team that

developed and deployed the Navy's initial operational capability in automated satellite communications systems

Joan Kaina, a nationally recognized expert in the field of data fusion, littoral undersea surveillance, and deployable autonomous distributed systems. She spearheaded the program planning for the Theater Acoustic Warfare Data Fusion Project

Rita Lane, for service as primary interface to the Military Strategic Tactical and Relay (MILSTAR) Joint Program Office regarding program schedule, status and risk identification and mitigation

Stephen Luby, for leadership of the Extending the Littoral Battlespace (ELB) mission payload integration and delivery to four ships and two mobile Marine Corps vehicles. He delivered products to ELB on time, within budget and above performance requirements

Stephen Martin, for management of an advanced sonar signal processing Advanced Technology Demonstration that exceeded performance goals by 200 per cent

Todd McKamey, for simplifying the acquisition process for industry and the government, drastically reducing the necessary cost-time commitment to prepare and evaluate proposals and developing a system that optimizes a best value source selection

Patrick Moore, who increased biosonar research funding to $2.2 million in FY2000, providing a strong scientific and academic international reputation that will keep SSC San Diego at the forefront of marine mammal research and development

Charles Moussa, for guiding complete realignment of the Fleet Engineering Department to meet new SPAWAR implementation requirements for the Integrated Battle Group/Amphibious Readiness Group installation process

Roger Nies, for providing vision, planning and execution to growing new business areas such as commercial satellite communications when the Communication and Information Systems Department reorganized

Herbert Poindexter, for leadership, inspiration and contributions to the Planning and Decision Aid System, including participation in every design and architectural issue

John Pryor, who was lead government member of the Advanced Deployable System Installation Sub-System Integrated Product Team, which was recognized by the Assistant Secretary of the Navy for significant contributions to the success of Department of the Navy acquisition reform

Jose Ramos, who was instrumental in development, implementation and evaluation of Battle Force E-Mail (BFEM), currently the sole means of ensuring data interoperability between the U.S. Navy and all

Allied navies. Using BFEM as a starting point, he established a new program based on the new NATO standard network protocol

Jim Rhode, for leading development and implementation of the Communication and Information Systems Department business plan. A small expenditure he directed at the Fleet Needs Capability Time Critical Strike resulted in a multi-year, multi-million-dollar program with the Office of Naval Research

Thomas Roy, for leadership and technical contributions to Non-Acoustic Distributed Systems Components and the Autonomous Off-Board Surveillance System, and for vision and leadership resulting in a new $15 million littoral undersea surveillance program he directs

Ken Simonsen, for leading one of the Department of Defense's most innovative programs, developed to counteract Global Positioning System (GPS) jamming

Teodoro Tanag, for service as Technical Director of the Center's Japan detachment, supporting employees, generating business, encouraging concern for individual and family needs that is essential for an overseas office

Jim Williams, for service as chief C^4I systems engineer on the staff of Commander, Submarine Force, U.S. Pacific Fleet, particularly for providing the first operational demonstration of underway submarine Secret Internet Protocol Router Network (SIPRNET) connectivity, leading to a Chief of Naval Operations decision to install this capability on all submarines immediately

Navy Award of Merit for Group Achievement

Standard Tactical Receiver Equipment Display (STRED) development

Greg Settelmayer
Melanie Jarvis
Deborrah Ahlgren
Scott Brookens
James Clancey
Anastasia Dimitriu
Bob Grant
Kevin Hackett
Margo Handshy
Jack Harden
Larry Hunt
Michele Kinkaid
Kenneth Koneval
Dorothy Kuckuck
Robert Lomicka
David Lowenstein
Larry Martin
James McNatt
Jeffrey Morgan

Meena Naik
Beverly Needham
Richard Phipps
Greg Pola
Marsha Powell
Garyanne Prince
Mike Reilley
Bruce Rickard
Don Rossignol
Gabe Schmera
Terry Sherping
David Smith
Todd Smith
Glenn Stuart
Frank Tirpak
John Volk
Deborah Warren

Navy Chief of Information (CHINFO) Merit Award

Third Place Award in Specific Audience, Newspaper Format category, to Center newspaper Outlook—JoAnne Newton, editor, and photographers Jerry Mosley and Alan Antczak

Special Achievement Awards

Commander-in-Chief, U.S. Pacific Fleet Special Achievement Award for support of Oahu Base Area Network implementation

Glen Adachi
Sandra Sclabassi

SPAWAR nominee for National Defense Industrial Association Tester of the Year

Debbie Depew

SOCIETY/TECHNICAL SOCIETY AWARDS

Lt. Jason Brandt, USN, first prize in U.S. Navy Institute Press *Proceedings* magazine essay contest

SSC San Diego earns Capability Maturity Model for Software Level 3 from Software Engineering Institute

Laura Hampton, San Diego Business Journal "2000 Women Who Mean Business" Award

CENTER AWARDS

Lauritsen–Bennett Awards

Dr. Jim Zeidler, for excellence in science, for his substantial efforts on wireless communications networks, co-discovering a new class of

nonlinear signal processing effects and leading an effort to characterize the performance of adaptive signal processing techniques for surface ship and submarine sonar, airborne antisubmarine warfare, and undersea surveillance applications

Frank White, for excellence in engineering, for contributions to and leadership in data fusion and system prototyping essential to development of a new generation of naval command and control systems. He served as the Center's representative for the Maritime Battle Center of the Naval Warfare Development Command, developing a strong supporting role for the Center

Executive Director's Award

Dr. Steven Whiteside, for contributions to the Advanced Deployable System, an undersea surveillance program. He was cited for his own technical contributions and innovations, and for leading integrated product teams of multiple contractors and government organizations, whose efforts were essential to achievement of program milestones and successful transition to engineering and manufacturing development

Elizabeth Gramoy, for her technical and programmatic leadership of multiple departmental teams in the area of software engineering process improvement, resulting in a national reputation for the Center in implementing new processes and procedures, and in attainment of Capability Maturity Model (CMM) Level III

Secretarial Awards

Geri Nicolson
Terri Freeland

Exemplary Service/Achievement Awards

Kevin Adams
Sergio Alonso
Allen Ashe
Michael Batey
Luis Biaggi
Ken Boman
Ken Boyd
Susan Briest
Cherri Broyles
Michael Bruch
Laura Bunney
Joseph Camacho
Tom Castle
Glenn Ching
Dennis Coffee
Helen Cook
Dana Cottrell
Willard Cronyn
Faye Esaias
Andrew Estabrook
John Evans
John Falbo
Cecile Fix
Chris Fletcher
Steven Foster
Kari Gizzi
Nicholas Gizzi
Jan Goode
Curtis Goodhart
Tammie Gore
Lynetta Grajeda
Daniel Greene
Sylvia Guadarrama
Richard Hall
Doug Hamaguchi
Sandra Harrell
John Howard
Mario Inchiosa
William Jackson
Steven Kennison
Lorna Kooiker
Ken Kaufmann
Jack Kuerzi
Kent Kuriyama
Thinh Lam
Richard Laverty
Guy Leonard
Joseph Loughlin
Ann Mayeda
George McCarty
David Miranda
John Mitchell
Shahrokh Naderi
JoAnne Newton

Jerrold Danzer	Carl Hicket	Nguyen Nguyen
Richard Davidson	Michael Hoernemann	Ahn Nuzen
Roger Easley	Elizabeth Holland	Mike Page
Litta Pangelinan	Mary Saavedra	James Tomitagawa
Tom Pastore	Jay Sakai	Mark Tukeman
Lisa Patubo-Daniel	John Simbulan	Carmen Ulloa
Susan Paulo	David Slade	Tom Underwood
Randy Peacock	Daniel Solan	Glen Urie
Gale Pennoyer	James Southerland	Bruce Van Hyfte
Timothy Peterson	Kathy Steffel	Debra Van Hyfte
Phuong Phan	Lyle Steger	Patric Vargas
Richard Poehling	Stephen Stewart	Robert Vik
Sharon Pritchard	Craig Stroing	Gary Ward
Patricia Provencio	Carol Stulz	Jon Wester
Barbara Rasmussen	Lynne Tablewski	Barbara Wiley
James Ritchie	Pamela Tarrell	Sheryl Wingard
Margaret Robbie	Miles Terayama	Michael Wood

MILITARY AWARDS

Navy And Marine Corps Commendation Medal

Lt. Cmdr. Tracy Conroy, USN, for work on Combat Survivor Evader Locator System and Situational Awareness Beacon with Reply program

Lt. Cmdr. Jerry Dismuke, USN, for service as afloat system engineer on the Naval Messaging Systems Program Office

Lt. Daniel Gabier, USN, for service as the E-2C software support activity fleet requirements officer at SSC San Diego

Navy and Marine Corps Achievement Medals

Lt. Janet Garrington, USN, for professional achievement as head of SSC San Diego Military Resources Management

Lt. Kathryn Christensen, USN, for service as deputy operations and planning manager for the Fleet Installations Management Office

Senior Chief Hospital Corpsman George Stevens, USN, for service as diving supervisor/team leader

Chief Aerographer's Mate Matthew White, USN, for service as lead SSC San Diego test engineer for all meteorology and oceanography systems afloat

Chief Cryptologic Technician (Collection) (Surface Warfare) Robert Boyd, USN, for service as Cryptologic Unified Build installations supervisor

Builder First Class (SeaBee Combat Warfare/Diver) Lowell Schrader, USN, for service as advanced underwater construction technician and diving supervisor at the Center

Sonar Technician First Class (Submarine Warfare) Robert Dyar, USN for service as the Assistant Test Director for the Advanced Deployable System

Engineman Second Class (Diver) William Stull, USN, for service as diving supervisor

SSC San Diego Sailor of the Year (1999)

Builder First Class Lowell William Schrader, USN

SSC San Diego Sailor of the Half Year (July to December 1999)

Information Technician First Class Mark McKenzie

Appendix B: 2000 Patents Awards

SSC SAN DIEGO CY 2000 PATENTS

Inventor(s)	Title	Patent No.	Date
Russell, Stephen D. Shimabukuro, Randy L.	Video Display with Integrated Control Circuitry Formed on a Dielectric Substrate	6,011,291	4 Jan 00
Bullat, David M.	High Impact Absorbing Body Armor with Self Actuating Mode	6,012,162	11 Jan 00
Wiesenfarth, Hans J.	Dual Orthogonal Near Vertical Incidence Skywave Antenna	6,014,107	11 Jan 00
Aklufi, Monti E. Russell, Stephen D.	Apparatus for Improving Crystalline Thin Films with a Contoured Beam Pulsed Laser	6,014,944	18 Jan 00
Boss, Pamela A. Boss, Roger D.	Thin-Layer Spectroelectrochemical Cell	6,015,479	18 Jan 00
Winton, Michael J. Russell, Stephen D.	Method of Making Improved Electrical Contact to Porous Silicon	6,017,811	25 Jan 00
Albert, Terence R. Bulsara, Adi R.	Noise Assisted Signal Processor with Nonlinearly Coupled Arrays of Nonlinear Dynamic Elements	6,020,782	1 Feb 00
Cronyn, Willard M.	Compact, Phasable, Multioctave, Planar, High Efficiency, Spiral Mode Antenna	6,023,250	8 Feb 00
Boss, Pamela A. Lieberman, Stephen H.	Fiber Optic Raman Sensor	6,028,666	22 Feb 00
Stein, David W. J.	Method for Detecting Weak Signals in a Non-Gaussian and Non-Stationary Background	6,038,526	14 Mar 00
Dawirs, Willis R.	Low Duty Cycle Navigation System	6,040,801	21 Mar 00
Scheps, Richard	Wavelength Independent Optical Probe	6,043,896	28 Mar 00
Theriault, Gregory A. Martini, Leonard J. Smith, Leon V.	Translation System for Directing an Optical Signal to Predetermined Coordinates	6,046,868	4 Apr 00
Olson, Jack R. Stevenson, J. Mark Sotirin, Barbara J.	Buoyed Sensor Array Communications System	Re. 36,643	4 Apr 00
Burns, Michael J. de la Houssaye, Paul R. Garcia, Graham A. Russell, Stephen D. Clayton, Stanley R. Barfknecht, Andrew T.	Monolithic Integrated High-T_c Superconductor-Semiconductor Structure	6,051,846	18 Apr 00

SSC SAN DIEGO CY 2000 PATENTS

Inventor(s)	Title	Patent No.	Date
Soltan, Parviz Trias, John A. Dahlke, Weldon J. Belfatto, Robert V. Sanzone, Frank Poulos, Christopher J. Acantilado, Neil P.	Computer Controlled Three-Dimensional Volumetric Display	6,052,100	18 Apr 00
Hansen, Peder M. Schukantz, James H. Prince, Robert D.	Split Rosette-Shaped Monopole Antenna Top-Load for Increased Antenna Voltage and Power Capability	6,054,964	25 Apr 00
Schlosser, Thomas W.	Context Based Error Detection and Correction for Binary Encoded Text Messages	6,061,821	9 May 00
Ho, Thinh Q. Rockway, John W.	System and Method for Isolating Radio Frequency Signals	6,067,448	23 May 00
Bond, James W. Hui, Stefen Velez, William Y.	Simplified Interference Suppressor	6,072,845	6 Jun 00
Freund, Richard F.	Scheduling Framework for a Heterogeneous Computer Network	6,076,174	13 Jun 00
Sun, Chen-Kuo Chang, Ching T. Nguyen, Richard Albares, Donald J.	Photovoltaic Optoelectronic Switch	6,078,111	20 Jun 00
Russell, Stephen D. Dubbelday, Wadad B. Shimabukuro, Randy L. de la Houssaye, Paul R. Szaflarski, Diane M.	Photonic Silicon on a Transparent Substrate	6,093,941	25 Jul 00
Altes, Richard A.	Feature Imaging and Adaptive Focusing for Synthetic Aperture Processor	6,088,295	11 Jul 00
Russell, Stephen D. Dynes, Robert C. de la Houssaye, Paul R. Dubbelday, Wadad B. Shimabukuro, Randy L. Katz, Andrew S.	Laterally Disposed Nanostructures of Silicon on an Insulating Substrate	6,103,540	5 Aug 00
Lieberman, Stephen H. Knowles, David S. Martini, Leonard J.	In Situ Microscope Imaging System for Examining Subsurface Environments	6,115,061	5 Sep 00
Ayres, Dwight T. Key, Jr., Carroll L. Pigott, Miles T. Wislicenus, George F.	Contact Exploder	6,105,504	22 Aug 00
Lind, Eric J.	Microminiature Neutron Detector	6,107,632	22 Aug 00

SSC SAN DIEGO CY 2000 PATENTS

Inventor(s)	Title	Patent No.	Date
Greer, Robert, A. Stamenkovich, Miroslav	Electronic Chart Assisted Navigation System	H1,878	3 Oct 00
Kuchta, Bernard J. Gardner, James L.	Extended Canister Fly-Through cover	6,123,005	26 Sep 00
Copeland, Hugh D. Mastny, Gary F. Patterson, Andrew E.	Colorimetric Red Blood Cell Sensor	6,130,743	10 Oct 00
Williams, Jack R. Sullivan, Shelby F. Alsup, James M.	Aural Enhancement of Active Sonar Systems	6,130,857	10 Oct 00
Arranaga, Alexander B. White, William D.	Slurry Mixture Forming an Additive for Producing a Hydrodynamic Drag Reduction Aqueous Polymer Solution	6,133,411	17 Oct 00
Grossnickle, Peter C.	System and Method for Determining the Time Difference of Arrival of a Frequency Shift Keyed Signal at Two Separate Receivers	6,137,842	24 Oct 00
Alpers, Frederick C.	CW Converter Circuit	6,133,865	17 Oct 00
Scheps, Richard	Over-The-Horizon Optical Communications Transceiver	6,137,609	24 Oct 00
Becker, Carol A.	Visible Light pH Change for Activating Polymers and Other pH Dependent Reactants	6,143,138	7 Nov 00
Theriault, Gregory A. Lieberman, Stephen H. Knowles, David S. Martini, Leonard J.	Laser Induced Breakdown Spectroscopy Soil Contamination Probe	6,147,754	14 Nov 00
Burns, Michael J. Houssaye, Paul R. de la Garcia, Graham A. Russell, Stephen D. Clayton, Stanley R. Barfknecht, Andrew T.	Method for Making a Monolithic Integrated High-T_c Superconductor-Semiconductor Structure	6,165,801	26 Dec 00

Appendix C: 2000 Distinguished Visitors

JANUARY

10 Rear Admiral Richard W. Mayo, USN
Director
Space, Information Warfare, Command and Control Directorate
Office of the Chief of Naval Operations

19 Dr. Charles Herzfeld
Chair
Warfare in the Information Age Task Force
CNO Executive Panel

20 Dr. Albert E. Brandenstein
Chief Scientist
Office of National Drug Control Policy
Executive Office of the President

21 Vice Admiral Dennis McGinn
Commander
Third Fleet

FEBRUARY

1 Mr. David S. Tarbell
Deputy Under Secretary of Defense
Technology Security Policy/
Director
Technology Security Directorate
Defense Threat Reduction Agency

3 Vice Admiral Walter F. Doran, USN
Commander
Seventh Fleet

10 Rear Admiral Albert H. Konetzni, Jr., USN
Commander
Submarine Force, U.S. Pacific Fleet

22 Rear Admiral Larry C. Baucom, USN
Director
Environmental Protection, Safety and Occupational Health Division
Office of the Chief of Naval Operations

MARCH

20-22 Dr. F. Mike Pestorius
Technical Director
International Field Office, London
Office of Naval Research

20 Dr. Albert E. Brandenstein
Director/Chief Scientist
Counterdrug Technology Assessment Center
Office of National Drug Control Policy, White House

30 Rear Admiral (Select) William Klemm, USN
Deputy Chief of Staff for Fleet Maintenance
U.S. Pacific Fleet

Rear Admiral George Yount, USN
Deputy Commander for Engineering
Naval Sea Systems Command

31 Rear Admiral (Select) David T. Hart, Jr., USN
Commander
Cruiser Destroyer Group One

APRIL

10 Dr. Pieter Frick
Dean
College of Engineering
San Diego State University

11 Dr. Richard Roca
Director
Applied Physics Lab
Johns Hopkins University

13 Admiral Dennis Blair, USN
Commander-in-Chief
U.S. Pacific Command

24 Rear Admiral William Copeland, Jr., USN
Special Assistant to
Commander Naval Air Force, U.S. Atlantic Fleet

MAY

1-3 Ms. Katherine Hegmann
Chair
Command Center Panel
Naval Research Advisory Committee

12 Honorable Howard Wayne
Assemblyman, 78th District
California State Assembly

15 Commodore David Arthur Lewis, RN
Head of Intelligence
Permanent Joint Headquarters
Northwood, United Kingdom

30 Ms. Diana Josephson
Principal Deputy Assistant Secretary of the Navy
(Installations & Environment)
Office of the Secretary of the Navy

31-Jun 1 Rear Admiral (Select) Kathleen K. Paige, USN
Chief Engineer/
Director
Theatre Air & Missile Defense & Systems Engineering
Office of the Assistant Secretary of the Navy
for Research, Development & Acquisition

JUNE

14 Brigadier General William L. Bond, USA
Commanding General
U.S. Army Simulation, Training & Instrumentation Command

26-27 Dr. Alison Brown
Chair
Technology Panel
Dr. John Borky
Chair
Interoperability Panel
Command and Control Summer Study
U.S. Air Force Scientific Advisory Board

JULY

5-7 Rear Admiral David J. Antanitus, USN
Director
C4ISR Installations & Logistics
Space and Naval Warfare Systems Command

10-11 Rear Admiral Richard West, USN
Oceanographer of the Navy

13 Dr. Vitalij "V" Garber
Director
Systems Interoperability
Office of the Under Secretary of Defense
(Acquisition, Technology & Logistics)

13	Rear Admiral Ronald F. Silva, USCG Assistant Commander for Systems Rear Admiral Vivien S. Crea, USCG Director Information & Technology Directorate Rear Admiral Ken T. Venuto, USCG Director Operations Policy Directorate United States Coast Guard Headquarters
17-28	Rear Admiral Jay Cohen, USN Executive Director Naval Research Advisory Committee/ Chief of Naval Research
	Dr. Patrick Winston Chair Naval Research Advisory Committee
19-20	Ms. Susan Bales Director Naval Fleet/Force Technology Innovation Office Office of Naval Research
19	Mr. Mick Blackledge Director of Technology Program Executive Office Theatre Surface Combatants Naval Sea Systems Command
20	Ms. Sherri W. Goodman Deputy Undersecretary of Defense (Environmental Security) Office of the Secretary of Defense Rear Admiral Christopher Weaver Commandant Naval District Washington Mr. Brad Campbell Region III Administrator Environmental Protection Agency
25	Honorable Howard Wayne Assemblyman, 78th District California State Assembly
25-26	Dr. Larry B. Stotts Director of Technology Office of the Assistant Secretary of the Army for Acquisition, Logistics & Technology

AUGUST

2 Mr. James Barnett
Professional Staff Member
Select Committee on Intelligence
U.S. Senate

Rear Admiral (Select) Gerald L. Hoewing, USN
Commander
Carrier Group Seven

7-8 Rear Admiral (Select) David J. Antanitus, USN
Vice Commander
Space and Naval Warfare Systems Command

15 Rear Admiral David Stone, USN
Deputy Director
Surface Warfare Division
Office of the Chief of Naval Operations

21-22 Ms. Betsy Phillips
Senior Staff Member
Sub-Committee of the Committee on Appropriations
U.S. House of Representatives

29-30 Rear Admiral George R. Yount, USN
Deputy Commander for Engineering
Naval Sea Systems Command

SEPTEMBER

1 Vice Admiral Chih-Hua Chang, TWN
Deputy Commander-in-Chief
Vice Admiral Cheng-Yun Huang, TWN
Fleet Command
Rear Admiral Chia-Cheng Gong, TWN
Bureau of Plans
Rear Admiral Gung-Kai Liang, TWN
Bureau of Combat Systems
General Headquarters Staff, Taiwan Navy

12 Mr. Rod Wijas
Director
Communications, Command, and Control Directorate
Office of the Assistant Secretary of Defense (C3)

14 Admiral James R. Hogg, USN (Ret.)
Director
Strategic Studies Group
Office of the Chief of Naval Operations

19 Rear Admiral James A. Robb, USN
Commander
Carrier Group Seven

OCTOBER

5 Rear Admiral William J. Marshall, III, USN
Commander
Amphibious Group Three

6 Brigadier General Gilbert R. Hawk, USAF
Director
Command, Control, Communications and Computer Systems
Rear Admiral Edward J. Fahy, USN
Director
Plans & Policy
U.S. Transportation Command

10 Rear Admiral (Select) Kirkland H. Donald, USN
Deputy Chief of Staff for C4I, Resources, Requirements & Assessments
U.S. Pacific Fleet

12 Rear Admiral Gwilym H. Jenkins, Jr., USN
Deputy for Acquisition & Business Management
Office of the Assistant Secretary of the Navy
for Research, Development & Acquisition

Mr. Charlie Giacchi
Executive Director
Naval Surface Warfare Center Port Hueneme Division

31 Rear Admiral David M. Stone, USN
Commander
Cruiser Destroyer Group Five

NOVEMBER

1 Rear Admiral Robert M. Nutwell, USN
Deputy Assistant Secretary of Defense
for Command, Control & Communications, Intelligence, Surveillance, Reconnaissance & Space Systems
Office of the Assistant Secretary of Defense

6 Major General Peter Franklin, USA
Deputy Director
Ballistic Missile Defense Organization

Rear Admiral (Select) Nancy Brown, USN
Deputy Director
Space, Information Warfare, Command & Control
Office of the Chief of Naval Operations

8 Rear Admiral William J. Marshall, III, USN
Commander
Amphibious Group Three

13 Dr. Albert E. Brandenstein
Director/Chief Scientist
Counterdrug Technology Assessment Center
Office of National Drug Control Policy, White House

27-28 Rear Admiral Rand Fisher, USN
Director
Space Technology Systems
Space & Naval Warfare Systems Command

DECEMBER

4 Rear Admiral William J. Marshall, III, USN
Commander
Amphibious Group Three

6 Dr. Allen R. Zeman
Director
Naval Training & Education
Office of the Chief of Naval Operations

Appendix D: 2000
Major Conferences and Meetings

JANUARY

12-13 U.S. Coast Guard National Distress and Response Systems Modernization Project Review

FEBRUARY

1-2 Defense Advanced Research Projects Agency Information Assurance Workshop

Office of Naval Research/Chief of Naval Operations Navigation Science and Technology Workshop

7-11 The Technical Cooperation Program C^3I Information Fusion Brief

29-3/2 Ocean Surveillance Information Systems Evolutionary Development Requirements Working Group

MARCH

2-3 Global Command and Control System—Integrated Imagery and Intelligence Conference

9 Navy Modeling and Simulation Technical Interchange Meeting

13-17 The Technical Cooperation Program Multistatic Active Sonar Technology Planning Meeting

20-22 National Defense Industrial Association Undersea Warfare Meeting

28-30 Network Users Working Group

APRIL

19 Global Positioning System Users' Conference

MAY

1-4 National Defense Industrial Association Third Joint Ballistics Symposium

22-23 17^{th} Annual US/UK Submarine Communications Symposium

22-24 Assistant Secretary of the Navy (Research, Development & Acquisition) Chief Engineer Monthly Meeting

22-25 Army Global Positioning Systems Integrated Product Team Working Group

JUNE

13	Global Command and Control System—Maritime Releasability Board Satellite Communications N6 Conference
13-15	Fleet N6 Conference
30	Intelligence Community Geospatial Conference

JULY

11-13	U.S. Coast Guard National Distress and Response System Modernization Project Advanced Concepts Technology Demonstration
12-13	Microelectromechanical Systems (MEMS) Day Conference
17-28	Naval Research Advisory Committee (NRAC) Summer Study

OCTOBER

10-12	French Navy/USN C^4 Interoperability Working Group Meeting
30-11/3	Range Commanders Council 105^{th} Optical Systems Group Meeting

NOVEMBER

14-15	Theatre Air Warfare Roundtable
28-30	SAASM Weapons Integration Working Group Meeting

DECEMBER

4-8	The Technical Cooperation Program Action Group 5/Technical Panel 4 Meeting
5-6	Naval Warfare Systems Forum XI

Appendix E: Acronyms

AAALAC	Association for Assessment and Accreditation of Laboratory Animal Care
ACALS	Army Computer-Aided Acquisition and Logistic Support
ACMS	Advanced Communications Management System
ACOA	Adaptive Course of Action
ACTD	Advanced Concept Technology Demonstration
ADNS	Automated Digital Networking System
AEM/S	Advanced Enclosed Mast/Sensor System
AFB	Air Force Base
AFCEA	Armed Forces Communications and Electronics Association
AHCI	advanced human computer interface
AORs	areas of operations
AREPS	Advanced Refractive Effects Prediction System
ARG	Amphibious Ready Group
ARL	U.S. Army Research Laboratory
ASCIET	All Service Combat Identification Evaluation Team
ATM	Asynchronous Transfer Mode
BADD	Battlefield Awareness Data Distribution
BDB	Business Development Board
BLII	Base Level Information Infrastructure
BMDO	Ballistic Missile Defense Organization
C.H.U.M.	Community, High Schools, Universities and the Medical School
C2	Command and Control
C3	Command, Control, and Communication
C4	Command, Control, Communications, Computers
C4I	Command, Control, Communications, Computers and Intelligence
C^4ISR	Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance
CA	Commercial Activities
CALS	Computer-Aided Acquisition and Logistic Support
CBDL	Corporate Business Development Leaders
CDAA	Circularly Disposed Antenna Array
CIC	combat information center
CINCLANTFLT	Commander in Chief, U.S. Atlantic Fleet
CINCPACFLT	Commander in Chief, U.S. Pacific Fleet
CNET	Chief of Naval Education and Training
CORBA	Common Object Request Broker Architecture
COTS	Commercial-off-the-Shelf
CPoF	Command Post of the Future
CRADA	Cooperative Research and Development Agreement
CSC	Computer Sciences Corporation
CSS	Coastal Systems Station
CVBG	virtual carrier battle group
CY	Calendar Year
DARPA	Defense Advanced Research Projects Agency

DCMA	Defense Contracting Management Agency
DCOM/COM+	Distributed Common Object Model
DDB	Dynamic Data Base
DIFMS	Defense Industrial Financial Management System
DISA	Defense Information Systems Agency
DISN-LES	Defense Information Systems Network, Leading Edge Services
DLTT	Data Link Test Tools
DMS	Defense Messaging System
DoD	Department of Defense
DoN	Department of the Navy
DUETS	Display User Enhancement Technology Systems
DUSD (AT)	Deputy Undersecretary of Defense for Advanced Technologies
ELB	Extending the Littoral Battlespace
EMCON	Emissions Control
EMI	electromagnetic interference
EPA	Environmental Protection Agency
EPLRS	Enhanced Position Locating Reporting System
ERP	Enterprise Resource Planning
FAA	Federal Aviation Administration
FBE-E	Fleet Battle Experiment-Echo
FBE-F	Fleet Battle Experiment-Foxtrot
FCTCPAC	Fleet Combat Training Center Pacific
GAO	General Accounting Office
GCCS–M	Global Command and Control System–Maritime
GOTS	Government-off-the-Shelf
GPS	Global Positioning System
GTEs	Gateway Terminal Emulators
HA/DR	humanitarian assistance/disaster relief
HAE UAV	High Altitude/Endurance Unmanned Aerial Vehicle
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HPCMP	High Performance Computing Modernization Program
HPO	High-Performance Organizations
HTACC	Hardened Tactical Air Control Center
IDS	Intrusion Detection System
IIWG	Improvement Integration Working Group
ILIR	In-House Laboratory Independent Research Program
INFOSEC	Information Security
IO	Information Operations
IO/A	Information Operations/Assurance
IOC	Initial Operational Capability
IOCOF	Information Operations Center of the Future
IP	Internet Protocol
IPL	Image Product Library
IPT	Integrated Product Team
IRM	Information Resources Management
ISDS	Information Screening and Delivery Subsystem
ISEA	In-Service Engineering Agent

ISNS	Integrated Shipboard Network Systems
ISO	Information Systems Office
ISR	Industrial Security Regulation
IT-21	Information Technology for the Twenty-First Century
J2EE	Java 2 Enterprise Edition
JAC	Joint Analysis Center
JCALS	Joint Computer-Aided Acquisition and Logistic Support
JRE	Joint Range Extension
JREAP A	JRE Application Annex A
JTF ATD	Joint Task Force Advanced Technology Demonstration
JTIDS	Joint Tactical Information Distribution System
JWID	Joint Warrior Interoperability Demonstration
LAN	Local Area Network
LCACs	landing craft air cushions
MATCALS	Marine Air Traffic Control and Landing System
MCE	Mission Control Element
MEO	Most Efficient Organization
MESA	Mathematics, Engineering, Science Achievement
MESC	Marine Environmental Survey Capability
MIDS	Multifunctional Information Distribution System
MIDW	Management Information Data Warehouse
MOA	Memorandum of Agreement
MTV	Multi-Sensor Tactical Data Visualization
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NAVSSI	Navigation Sensor System Interface
NCS	Net Control Station
NDIA	National Defense Industrial Association
NGII	Next Generation Information Infrastructure
NIMA	National Imagery and Mapping Agency
NSBE	National Society of Black Engineers
NWCF	Navy Working Capital Fund
NWDC	Naval Warfare Development Command
OBAN	Oahu Base Area Network
ONR	Office of Naval Research
OPNAV	Naval Operations
OSAW	Open System Advanced Workstation
OSD	Office of Secretary of Defense
PC	personal computer
PEO-EXW	Program Executive Office for Expeditionary Warfare
PET	Programming Environment and Training
PLI	Position Location Information
PLI-COM	Position Location Information-Character Oriented Message
PSO	Procurement Support Office
PwC	PricewaterhouseCoopers
QMB	Quality Management Board

R&D	Research and Development
RDF	Radio Direction Finding
RIMPAC	Rim of the Pacific
RISC	Reduced Instruction Set Computer
ROV	Remotely Operated Vehicle
RDT&E	Research, Development, Test and Evaluation
RTS	Real Time Subsystem
S&T	Science and Technology
SAR	Search and Rescue
SATCOM	satellite communications
SBBL	Sea Based Battle Lab
SCE	Software Capability Evaluation
SDFI	STARS/DIFMS Financial Interface
SEI	Software Engineering Institute
SEPO	Software Engineering Process Office
SIF	Systems Integration Facility
SIMS	Supply Information Management System
SIP	Single Integrated Picture
SIPRNET	Secure/Secret Internet Protocol Router Network
SPAWAR	Space and Naval Warfare Systems Command
SPI	Software Process Improvement
SPOT	Soldier Position Orientation and Tracking
SSA PAC	SPAWAR Systems Activity Pacific
SSC San Diego	Space and Naval Warfare Systems Center, San Diego
SSIXS	Submarine/Satellite Information eXchange System
STJ	Satellite TADIL-J
SW-CMM	Software Capability Maturity Model
TADIL	Tactical Data Link
TCC	Test Control Center
TCOE	Training Center of Excellence
TIDES	Translingual Information Detection, Extraction, and Summarization
TIE	Technology Integration Experiment
TJHS	TADIL J Host Simulators
TMD	theater missile defense
TTO	Tactical Technology Office
UAV	Unmanned Aerial Vehicle
UCSD	University of California, San Diego
UHF	Ultrahigh Frequency
UII	Unified Industries Incorporated
UML	Universal Modeling Language
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
URMTT	Universal Radar Moving Target Transponder
USCG	U.S. Coast Guard
USCINCPAC	Commander-in-Chief, U.S. Pacific Command
USEUCOM	United States European Command
USMC	U.S. Marine Corps

WFP	World Food Program
WIRE	Wet-End Inspection, Repair, and Recovery Element
WMD	weapons of mass destruction
XML	Extensible Markup Language
XSL	Extensible Scripting Language

References/Notes

[1] Outlook, "Procurement Support Office Established 24 November 2000," Volume 23, Number 25

[2] Outlook, "SSC San Diego Wins Commercial Activity Decision," 14 April 2000, Volume 23, Number 8; Outlook, Warehouse Operations Decision Made Final," 23 June 2000, Volume 23, Number 13

[3] Outlook, "Deputy Executive Director for Corporate Operations Hop Porter Retires," 13 October 2000, Volume 23, Number 21

[4] Outlook, "Supply and Contracts Department Head CMDR Bruce Green retires 4 August 2000," Volume 23, Number 16

[5] Outlook, "CAPT (Sel) Rich Mendez Heads Supply and Contracts Department," 27 October 2000, Volume 23, Number 22

[6] Outlook, "Fleet Engineering Department Heads Highlighted," 13 October 2000, Volume 23, Number 21

[7] Outlook, "Carmela Keeney Heads D70," 12 May 2000, Volume 23, Number 10

[8] Outlook, "Moussa is New Technical Director," 3 October 2000, Volume 23, Number 21

[9] Outlook, "Annual Tech Board Meeting Held," 23 June 2000, Volume 23, Number 13

[10] Outlook, "Center Leadership Philosophy Encourages Workforce Involvement," 1 September 2000, Volume 23, Number 18

[11] The Project Cabrillo intranet site, established on 9 June 2000, provides the Center with complete documentation of the project. Publicly available information about Project Cabrillo is documented in the following editions of the SSC San Diego Outlook.

Outlook, "SSC San Diego Leads Enterprise Resource Planning Initiative," 12 May 2000, Volume 23, Number 10

Outlook, "SSC San Diego Selects System Integrator for ERP," 21 July 2000, Volume 23, Number 15

Outlook, "SSC San Diego Completes Part One of Enterprise Resource Planning Initiative," 13 October 2000, Volume 23, Number 21

Outlook, "SSC San Diego Completes the Second Part of Project Cabrillo," 13 October 2000, Volume 23, Number 21

Outlook, "Realization Phase is Well Underway for Project Cabrillo," 10 November 2000, Volume 23, Number 24

[12] Outlook, "Single Integrated Picture Added as Major Business Thrust," 8 December 2000, Volume 23, Number 26. SIP steering team representatives included Bill Pettus, Navigation and Applied Sciences Department (D30); Tim Rastok, Command and Control Department (D40); Ken Campbell, Intelligence, Surveillance and Reconnaissance Department (D70); and Cliff Warner, Communication and Information Systems Department (D80).

[13] Outlook, "CBDLs Build Portfolios," 26 May 2000, Volume 23, Number 11. Designated CBDLs: Unmanned Air Vehicles (UAVs) - Andy Estabrook; U. S. Coast Guard (USCG) - John Audia; U. S. Marine Corps Science and Technology (S&T) - Chuck Mirabile; Crisis Response/Consequence Management - Dr. Brenda-Lee Karasik; Time Critical Strike -

Dennis Hurst; Air and Missile Defense - James Brauer; Information Operations/Assurance (IO/A) - Jim Price and John Ballard

[14] Outlook, "HPO Seminar Attendance Tops 1000," 26 May 2000, Volume 23, Number 11. Six candidates were selected as in-house facilitators. They are Cecilia Burrus, Dennis Davison, Brian Groarke, Dr. Gabe Lengua, Dr. Mike Kalman, and Alan Olson. The facilitators have established the HPO seminar web site at this address: http://iweb.spawar.navy.mil/resources/hpo

[15] Outlook, "Workforce QMB Develops Informal Mentoring Program," 4 February 2000, Volume 23, Number 3, by Dr. Brenda-Lee Karasik, Program Development, D101. The address of the web site is http://iweb.spawar.navy.mil/sandiego/mentor/

[16] Outlook, Reengineering Team Announces Process Improvements," 7 January 2000, Volume 23, Number 1

[17] Outlook, "DoD High Performance Computing Modernization Program Nurtures Skills at SSC San Diego," 27 October 2000, Volume 23, Number 22. This Outlook article was authored by Dr. Aram Kevorkian and Dr. Lynn Parnell, SSC San Diego high performance computing coordinators. The MATLAB courses held at SSC San Diego were given by Dr. Stan Ahalt, Dr. Ashok Krishnamurthy, and Dr. Dev Prabhu from Ohio State University's Electrical Engineering Department. Special thanks to Stephanie Teevan and Jennifer Moses from the ARL PET Training Coordination Center, Aberdeen Proving Ground, Maryland. Also, thanks to Guy Anderson, Technical Services Branch (D0297); Denise Burnham, Information Technology Division (D029); Dennis Coffey, (D0297); Amelia Degen, Personnel Management Support Office (D0207); and Dr. Mel Moy, Operations and Maintenance Branch (D0299).

[18] Outlook, "Scholarship/Endowment Supports Academia," 29 September 2000, Volume 23, Number 20

[19] Outlook, "Scholarship/Endowment Supports Academia," 29 September 2000, Volume 23, Number 20

[20] Outlook, "2000 MESA Shadow Day Held," 4 August 2000, Volume 23, Number 16. Volunteer mentors for the program this year were David Mendoza, Signals Technology Branch (D841), and Jeff Clarkson, Synthetic Forces (D44206).

[21] Outlook, "Software Engineering Policy Signed," 13 October 2000, Volume 23, Number 21; by Beth Gramoy, Office of Science, Technology, and Engineering Operations (D12). Captain Valdes stated: "These two efforts form a strong foundation for our command-wide initiatives to improve our overall systems engineering process." He went on to say: "The work that we do, and the products we deliver to the joint warfighter, require us to practice a very high level of scientific and engineering discipline and rigor. We must always strive to raise the bar of excellence, and to ensure that we deliver fully integrated, tested, and quality products to the warfighter. Our customer, the fleet, expects and deserves nothing less." Also, as noted in the commanding officer's all-hands e-mail, the Center is engaged in a significant effort to improve our ability to develop quality software and is already realizing return from its investment. One of the pilot projects in the SPI initiative recently reported that even though their last software build was the most complex to date, it took only half the time to complete final integration and testing compared to previous builds. Another pilot project reduced trouble reports by 71 percent, staff months to conduct tests by 33 percent, and staff months to fix all trouble reports by 70 percent. Both projects attribute these successes directly to software process improvement.

[22] Outlook, "SSC San Diego Earns a Capability Maturity Model Level 3," 10 November 2000, Volume 23, Number 24

[23] Outlook, "Enhanced Position Location Reporting System Demonstrated," 15 September 2000, Volume 23, Number 19

All of the elements were located in a simulated field environment complete with camouflage netting and a High Mobility Multipurpose Wheeled Vehicle (HMMWV) EPLRS NCS. Staff Sgt. Abrahm Polaski, the Position Location Reporting System (PLRS)/EPLRS technician stationed with Commander, Amphibious Group One, Sasebo, Japan, provided invaluable technical support. The demonstration was coordinated by D337 Branch Head Deborah Tharp. The following personnel from D337 provided valuable support in making this demonstrate a success: Cary Meriwether, Brian Hobson, George Titus, Debbie Castro, Rich Downie, Gerald MacKenzie, and Nelson Estanol and High Technology Solutions contractors Rich Bonavida, Jack Godwin, Lee Purrier, Laird Wallace, Angie Cisnernos, and Eric Wade.

[24] Outlook, "Global Positioning System Anti-Jam Antenna Evaluated," 29 September 2000, Volume 23, Number 20. SSC personnel responsible for the successful execution of these tests were Jeanne Abriel, Dr. Charles Manry, Paul Moore, Ted Reed, and Chinh Tran. Key contractor support people were Al Morrison Mark Suycott, Tom Broadaway, and Mark DeBoer.

[25] Outlook, "SSC San Diego advances research to restore Anacostia Watershed," 24 November 2000, Volume 23, Number 25. SSC San Diego scientists included Brad Davidson, Gunther Rosen, Andy Patterson, and Jon Groves, led by Chuck Katz. "We demonstrated a variety of environmental sensors that measure parameters in real-time using the MESC, which is a data gathering and analysis system. We were invited to participate by the Anacostia Watershed Toxics Alliance (AWTA), a river stakeholder group which includes EPA, National Oceanographic and Atmospheric Administration, the Navy, local universities, and industry. We were funded by AWTA to support modeling efforts, gain better understanding of the distribution of contaminated sediments in the river, and evaluate water quality. The program got a lot of visibility in Washington because of the rivers' central location in the middle of Washington, D.C. and because the Anacostia is reported to be quite polluted," Pete Seligman said.

[26] Outlook, "SSC San Diego Team Makes It Happen in BFE-Foxtrot," 18 February 2000, Volume 23, Number 4. CMDR Bill Schlichter was the SSC San Diego program manager responsible for the overall command, control, communications, computers, intelligence, surveillance and reconnaissance (C^4ISR) integration, installation, and financial management of FBE-F.

Ken Kaufmann, Systems Engineering (D4402), was tasked to build a team that could quickly understand the various aspects of the experiment's parts. Kaufmann had the final responsibilities for understanding the time critical targeting course of instruction (COI), along with the selection and implementation of a voice conferencing system, and a simulation support network. Kaufmann's team then had to design an integrated C^4ISR architecture to support the various experimental goals in a protracted implementation schedule.

Kaufmann had the support of Bob Leone, Deputy for Operations Office (D721), to help in the design of the mine warfare and antisubmarine critical areas of interest. CMDR Vince Shahayda, Intelligence Office (D017), was responsible for supporting development of the WMD cell. Additionally, Dr. Dan Cunningham, New Professional Group (D02P), maintained the engineering documentation. Cunningham and Paul Iordanides, Simulation Infrastructure (D44204), tested various voice conferencing options and provided recommendations for FBE-F implementation.

Extremely High Frequency (EHF) Communications Technician Jess Downey, EHF Satellite Communications Branch (D622), was responsible for designing, installing and maintaining the EHF network that was the backbone of the FBE Joint Fires Network.

CMDR Schlichter said, "Downey's technical knowledge and skillful troubleshooting allowed him to maintain an impressive 98 percent connectivity rate in an extremely complex network infrastructure. He voluntarily conducted extensive and comprehensive EHF technical and operator training for watch and maintenance personnel. His diligent efforts and resourcefulness in maintaining the EHF network was key to the overall success of FBE-F."

In charge of the physical installations was Mark Blocksom, Systems Engineer (D6404). A retired chief petty officer, Blocksom's knowledge of shipboard installations and the unique subtleties of the Navy process was instrumental in laying down the networks and getting the equipment installed in very short order. Blocksom was the only member of the team who had worked on an FBE prior to Foxtrot and he was able to anticipate changes and alert the team. His installation team configured USS KENNEDY (CV 67), USS JOHN YOUNG (DD 973), and USS JOHN PAUL JONES (DDG 53) with equipment and the C^4I architecture necessary to support the distributed fires network.

Supporting finance team members were Frank Schindler, Joe Michel, Kathy Davis, and Amelia Moran. "Our FY 00 funding was delayed by almost one month," said CMDR Schlichter. "My financial staff teamed with Carolann Kossler, Carol Haney, and Thelma Jones of Financial Control (D02112) to perform a minor miracle by moving close to $5.0 million in the first 10 days of November. Had it not been for the total dedication of this dynamic team the experiment never would have happened because the people and equipment would not have arrived in the Persian Gulf in time," he said. Schindler also credits the SSC San Diego Supply and Contracting Department (D20). "Without their help we never would have made it," said Schindler. "Once we had acquired the equipment, the shipping and receiving folks immediately turned it around and got it out to Bahrain in record time and in perfect condition."

[27] Outlook, "SSC San Diego JTF ATD Team Completes Software Composability Research at DARPA," 4 February 2000, Volume 23, Number 3

There were many researchers involved in this project over the past five years. All should be recognized but that is not feasible. The JTF ATD Engineering Board and a few other key people and companies should be mentioned. The Engineering Board who directed the research and development of this project were: Chairman Ref Delgado who is the DARPA project manager; Bill Ray, chief engineer; Mike Dean, chief software engineer, Bolt, Beranek, and Newman Incorporated (BBN) - later replaced by Jim Chatigny (BBN-Hawaii); Rick Goodwin, lead software developer, Science Applications International Corporation, San Diego (SAIC-SD) - later replaced by Andy Farrar (SAIC-SD); Lou Coker, software developer, Teknowledge Federal Systems - later replaced by Lance Whitesel, software developer (ISX-Arlington). Providing overall guidance were Rick Hayes-Roth, Teknowledge Federal Systems; and Joe Green of Real Time Systems Incorporated. SSC San Diego played a very important role in the project. Individuals like John Schill, later replaced by Ref Delgado, served as JTF ATD DARPA program manager. Key players were Brad McMurrey, Bill Ray, Krysten Maracle, Les Anderson, Pat Osborne, Linda Dunham, Wanda Lam, Trudy Morgan, Brenda Hafner, and Cyril Pedrano.

[28] Outlook, "Image Product Library Fielded to First of Unified Commands," 14 April 2000, Volume 23, Number 8. Frank Greco is the installation team leader and Vivian DiCristofaro is project manager for the new version of software operating on a Navy shipboard IPL system. Vivian DiCristofaro said, "Our responsibility for the USEUCOM fielding of IPL systems covered 22 sites with 31 suites of equipment. We have successfully deployed these systems in theater to sites located in England, Germany, Italy, and onboard the USS LASALLE (AGF-3). On March 21, IPL software version 2.1 successfully passed USEUCOM site acceptance testing at the JAC located in Molesworth, England and reached initial operational capability for the theater. This clears the path for

component IOC's planned for April and May. Theater full operational capability is scheduled for June of this year."

[29] Outlook, "Advanced Human Computer Interface Developed," 21 July 2000, Volume 23, Number 15. Dr. Hiekeun Ko is the project leader for D44210's Open System Advanced Workstation (OSAW) and Display User Enhancement Technology Systems (DUETS) projects. Both projects are funded by the Office of Naval Research (ONR) Human Systems Department (ONR-34), headed by Dr. Hal Guard. Dr. Helen Gigley (ONR-342) is the DUETS program officer. Dr. Ko's team members for the AHCI for Q-70 project are: Dr. Jerry Kaiwi, 3-D audio applications; Dan Lulue, speech technology; Jack Houghton, interface programming; Dr. Mike Cowen, 3-D perspective view applications; Elaine Schiller, 3-D display technology; Bryan Croft, 3-D programming; and Ryan Herchenbach, JAVA 3-D programming. The multimodal task analysis and multiple display studies were conducted by Pacific Science and Engineering Group, Incorporated. The cognitive and behavioral task analysis for 3-D displays used in the CIC was done by Instructional Science and Development, Incorporated.

Percy Tolbert, NAVSEA Q-70 Program Office (PMS-440), is the project officer of OSAW/DUETS. Michele McGuire, SPAWAR Concepts, Technologies and Prototypes (PMW-133), is the program manager of NC Q-70 programs.

[30] Outlook, "Center Participates in Disaster Relief Civil-Military Exercise," 18 August 2000, Volume 23, Number 17. Those contributing to the success of Strong Angel from the Command and Control Department (D40) and contractor participants were: Wayne Nelson, Beth Sundheim, Ken Boyd, Sue Ellen Moore, Mark Fowler, Sue Roach, Jack Cater, Mark Adkins, and Bob Younger.

[31] Outlook, "Test Tools and Technical Team Play Vital Roles at ASCIET 2000," 28 April 2000, Volume 23, Number 9. Lt. CMDR Joseph Mauser (D4524) coordinated SSC San Diego's participation in ASCIET 2000. The technical team included Rob Turner, the code's technical lead for data link field engineering, and field engineers Jerry Bailey, Eric Kruger, Peter Sua, and Roddie Walker of Digital Wizards. Kruger was there as the Command and Control Processor Tactical Digital Information Link (TADIL) analyst for the Joint Integrated Air Defense System Interoperability Working Group. Many of the commands at ASCIET 2000 assisted by the SSC San Diego team expressed appreciation for the team's help. In a letter, R.M. Aspinall, British Royal Air Force Squadron Detachment Executive Officer for ASCIET 2000, thanked and complemented Walker, Bailey, and Kruger for their assistance. "Without their support, our own contribution to the very important functions of ASCIET would have been diminished," he wrote.

[32] Outlook, "Network Centric Q-70 Systems Provided for USS Coronado,"26 May 2000, Volume 23, Number 11. D4223's portion of the Q-70 program was demonstrated in November 1999 at an open house sponsored by PD-13 and PMS-440. Bill Wilder is the PEO EXP/PMS-440 sponsor. Michele McGuire is the PD-13 sponsor and program manager in San Diego. D40 personnel responsible for the program success were: Mike Kono, chief architect; Pat Osborne, project manager; Lt. CMDR Larry Brachfeld, fleet liaison officer/network operations; Ted Tran, project engineer; Greg Mani, project engineer; Joe Discar, senior lead engineer; Dennis Bulai, project engineer; Caterina Brott, systems administrator; Aaron Lewis, systems administrator; and Derek Fox, support technician.

D644 personnel responsible for the successful installation and integration on board USS CORONADO were: Mark Blocksom, integration manager; Jeff Wildasin, installation lead; Doug Hawthorne, project lead; Randy Runyoun, installation support; and Rene Fuentes, support technician.

[33] Outlook, "Solution to Link-16 Line of Sight Limitation Demonstrated," 5 January 2001, Volume 24, Number 1. The Tactical Systems Integration and Interoperability Division (D45) provides test and command and control processor development support to BMDO

JRE via the Space and Naval Warfare Systems Command Advanced Tactical Data Link Systems (ATADLS) Program Office (PMW-159). Maj. Gen. Franklin was hosted by Command and Control Department Deputy of Business John Iaia, SSC San Diego Executive Officer CAPT Sharon Shelton, and PMW-159 Program Manager CAPT Ronald Polkowsky. Senior Lab Engineer Pal Segui, Test and Evaluation (D4524), led the modernization efforts to make the TCC a multipurpose facility. Segui said: "I am glad Maj. Gen. Franklin came here. It provided us the opportunity to demonstrate existing capabilities and introduce new technology into the TCC." Link-16 Test and Evaluation (D4524) Deputy Business Area Manager Tom Castle stated: "Our test team is committed to the JRE program. We allocated a considerable number of personnel and equipment resources to ensure the demonstration was a success." Dave Smith, Littoral Communications Systems Branch (D846), provided critical connectivity from the Navy Ultrahigh Frequency Satellite Communications (UHF SATCOM) Test Facility. Dave McDermott (D4524) provided timely DLTT and multimedia technical support that ensured the demonstration was a success. In addition to D4524 lab assets, Mitch Gillette of Software Support (D4523) provided the demonstration from the System Evaluation and Test Site (SETS) in Building C60.

[34] Outlook, "Newly Commissioned Design War Room Makes a Difference for the Fleet," 5 January 2001, Volume 24, Number 1. Lt. CMDR Ken Frack manages the Design War Room. Until December the Installation Management Office (D60F) was headed by CMDR Rich Evert. Jack Cabana now heads D60F and his deputy is Tom Woodland. Lt. CMDR Ken Frack stated: "Our challenge is to figure how to best exploit the capability we have with the important people co-located and to train everyone on how to take advantage of the situation synergy. We are getting away from the crisis management of the past caused by physical separation. I met with the class desks and planning yard reps with the goal of finding holes in our processes. We will continue process improvement and as we find better ways of doing business we will incorporate them. We want to ensure that no issues fall through the cracks and damage our credibility. Our goal is to serve the fleet with better installs. With good design and planning we should be able to do this more effectively. It will be a long term project with continual emphasis on improving the process."

[35] Outlook, "Joint Computer-Aided Acquisition and Logistic Support Deployed," 17 March 2000, Volume 23, Number 6

[36] Outlook, "Institute Has Ribbon Cutting and Grand Opening," 18 August 2000, Volume 23, Number 17. Ken Garcia headed the Integrated Product Team (IPT) tasked to specifically address end-to-end training, documentation, on-the-job training, curriculum issues, and to make sure fleet training requirements could be met. Garcia's team members include: Lt. Mary Kortz, Master Chief Electronics Technician (Surface Warfare) Eduardo Flores, Paul Kochur, Steven Franck, Alex Rice, Dennis Stewart, Jim Jennings, George Frederick, and the SPAWAR Navy Reserves. That team developed the original IPT into the SPAWAR Institute.

[37] Outlook, "SSC San Diego Prototype Technology Enables Rescue of Lost Boater," 1 September 2000, Volume 23, Number 18. Project manager is Dave Morin. In response to the call from the Coast Guard, Galard Mills performed real-time bearing captures on the distress signals, Mike Reaves and Jim Allen performed post-facto bearing analysis to refine the position estimate, and Joe Loughlin passed the information periodically to the Coast Guard by phone. Dave Morin remarked that the SSC San Diego team was very excited that a prototype system they developed was so successful in a real operational situation - especially one that saved a life. "It could not have been a better demonstration that RDF technologies can help take the 'search' out of search and rescue. This success has helped to solidify our working relationship with the USCG," Morin said.

[38] Outlook, "Teaming Provides Real-Time Weather Surveillance." 24 November 2000, Volume 23, Number 25. Kenn Anderson, Claude Hattan, and Bill Moision (D858)

coordinated local arrangements for the radar installation and Tom Gaydos of Facilities (D0362) did an exceptional job of ensuring site preparation was accomplished on time. The Physical Distribution Operations Team (D20C) personnel did a fine job of unloading and staging the radar equipment at a site that was not easily accessible. In a *Radio Science* paper, Ted Rogers of SSC San Diego D858 demonstrated that evaporation duct heights could be inferred from radar clutter returns using data from the Space Range Radar at Wallops Island, Virginia. Using data from the USS O'KANE (DDG 77) and the USS NORMANDY (CG 60), Lee Wagner (D858) demonstrated the technique would work for AN/SPY-1 radar in wind speeds of 3 meters per second or greater. Amalia Barrios (SSC San Diego D858) has undertaken a modeling effort to explore various techniques for obtaining refractivity from land clutter.

[39] Outlook, "Innovative Technology Replaces HF Receive Antennas," 7 July 2000, Volume 23, Number 14. The current probe concept was originated in 1994. Lee Tennison, now Mobile Systems Branch (D341), marketed the idea and the program was managed by William Kordela, now SPAWAR Program Manager for Information Warfare - Defend (PMW-161). The current probe design was conceptualized and the design methodology developed by Jim Schukantz of Applied Electromagnetics Branch (D851). The development team under project manager Dan Tam are: engineer Jim Schukantz, project assistant Bob Abramo, model builders Bob O'Neill and Fred Blas, and test team members Mike McGinnis and Bob Henry.

[40] Outlook, "VRTDS Blends Wearable Computing with Wireless Communications," 14 April 2000, Volume 23, Number 8. Dr. Steve Murray, Sensor Processing and Human Interface Branch (D374), and Lt. CMDR Kragh, Networks Technology Branch (D827), are developing the Virtual Reality Technical Data System (VRTDS). The Demonstrator of Advanced Wireless Networks Project (DAWN) is led by Lt. CMDR Kragh. The AITS team includes Steve Martin, Mike Phillips, Ray Garrido (D374); and Dale Bryan and Hoa Nguyen of the Adaptive Systems Branch (D371). This team blended a variety of technologies to provide man-on-the-move distributed information and communications support for soldiers and Marines in the field. The central focus of the AITS project, however, was a graphical, intuitive method for information display called augmented reality. "This is different from virtual reality," said Dr. Murray. "We're using see-through displays worn on the head, and synchronizing their content with the real world environment using small sensors that determine the location and direction of the user's gaze. In effect, we're augmenting information in the real world. The concept is similar to a pilot's head-up display where tactical symbols are overlaid on other aircraft or terrain features." He said, "AITS was designed for field soldiers, specifically for tactical security forces who must monitor arrays of deployed sensors in order to protect a deployed operations area like an airstrip or command post. When sensors detect an intrusion, they transmit an alert signal to soldiers who currently have to monitor workstations and correlate this information with field maps. Each AITS system is equipped with a personal Global Positioning System. This location information allows the wearable AITS computer to process and present the location of the intrusion directly onto the user's head-worn display via a target reticle, regardless of where the user is located. There is no need to perform manual position calculations although we've also provided the system with a real time, dynamic map display that depicts the positions of all sensors, targets, and other friendly forces." AITS communications are performed using Internet protocols, augmented for the tactical field environment through a software package called Acknowledged Datagram Protocol (ADP). "ADP, developed by Mike Phillips, allows us to share data among multiple AITS users and command nodes under unreliable field communications conditions," Dr. Murray said. "We've also tried to get away from the keyboard and mouse tools that come with most commercial wearable systems these days. They're just not practical for mobile soldiers. We've experimented with voice control of computer functions. We've also tested gesture control using a specially instrumented flight glove. The final set of AITS features will depend on a final round of evaluations by both

Army and Marine Corps user communities to see which tools and displays are most effective for the tactical security mission."

[41] Outlook, "Appreciation Ceremony Celebrates Integrated Installation Teams' Successful Accomplishments," 19 January 2001, Volume 24, Number 2

SPAWAR Chief Engineer (05) Rear Adm. (Sel) Mike Sharp delivered opening comments and explained how important everyone's efforts are in this time of radical changes in the way installations are conducted. Code D90's leadership and ship superintendents heard the presentations and were acknowledged via video teleconference in Japan, Hawaii, and Guam. SSC San Diego Naval officers Lt. CMDR Ken Frack, Lt. CMDR Miguel San Pedro, Lt. Kate Christensen, Lt. Jon Moore, and Lt. Uriah Zachary received Navy Achievement Medals for their involvement as part of these teams. CMDR Rich Evert pointed out that the real job satisfaction comes from knowing that the ships have capabilities they didn't have before. "There is a tangible reward from seeing the new systems we are providing the fleet. There is a material reward that comes from that!" he said. The letter of appreciation from CAPT Valdes and Dr. Kolb stated, "The integrated installation teams overcame significant obstacles to provide the warfighter with the latest technology necessary to maintain information dominance while executing the Navy's mission worldwide."

[42] Outlook, "SSC San Diego Provides Desktop Connectivity to Fleet," 24 November 2000, Volume 23, Number 25. Contributing to OBAN in key areas were: Lynne Briggles and Jody Watts, Systems Engineering and Development Branch (D9161); Justin Lee, Richard Fernandez, Kent Kuriyama, Tim Mehlhorn, and Sid Kobashigawa, Command, Control, Communications, Computers, and Intelligence programs, Hawaii (D424); and Sandra Sclabassi, System Integration and Networks Sector (D912).

[43] Outlook, "ISNS LAN Completed on USS HAMILTON," 26 May 2000, Volume 23, Number 11

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